



**US Army Corps
of Engineers**
Memphis District
Mississippi River Commission

EASTERN ARKANSAS REGION COMPREHENSIVE STUDY

GRAND PRAIRIE REGION AND BAYOU METO BASIN, ARKANSAS PROJECT

GRAND PRAIRIE AREA DEMONSTRATION PROJECT

GENERAL REEVALUATION REPORT



**VOLUME 1
MAIN REPORT
&
FINAL
ENVIRONMENTAL IMPACT STATEMENT
(FEIS)**

SEPTEMBER 1999

**RESPONSES
TO
PUBLIC REVIEW COMMENTS**

**GRAND PRAIRIE AREA
DEMONSTRATION PROJECT
GENERAL REEVALUATION REPORT
AND
DRAFT ENVIRONMENTAL IMPACT
STATEMENT**

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TO
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GENERAL REEVALUATION REPORT
AND
DRAFT ENVIRONMENTAL IMPACT STATEMENT**

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EASTERN ARKANSAS REGION COMPREHENSIVE STUDY GRAND PRAIRIE AREA DEMONSTRATION PROJECT

DRAFT GENERAL REEVALUATION REPORT (GRR)

(Responses To Comments from Public Review -- Only those comments requiring a response are included in this presentation. A copy of all comments received from the public review is attached.)

- I. State of Arkansas
Department of Pollution Control and Ecology
8001 National Drive, P.O. Box 8913
Little Rock, Arkansas 72219-8913

Comment 1. What is the minimum flow in cubic feet per second that will be used for the pump cut-off level? The GRR gave a range of flows based on mean monthly flows in the State Water Plan. The Department needs an actual minimum flow number.

Response 1. As stated in the GRR, the pump cut-off level is based on the Arkansas State Water Plan. The minimum flow rate will vary month to month as shown in Hydraulics and Hydrology (H and H) Appendix, pages IV-3 and IV-4. Based on the referenced pages, 9,650 cfs in the months of August, September, and October is the minimum flow rate. All pumping will be stopped when this level is reached.

Comment 2. How will sediment transport and scour be controlled in the 184 miles of earthen canals?

Response 2. As stated in H and H Appendix, 5-B-03 Summary, the potential for deposition, as presented, represents worst-case conditions. Limited sediment data in the White River indicates suspended sediment concentrations of approximately 74 mg/l. Inlet channel deposition was predicted to remove virtually all of this material; therefore, water actually entering the canal system should be relatively sediment free. As such, deposition rates shown for concentrations of 40 mg/l and 60 mg/l would significantly overstate depositional tendencies. Actual deposition within the canal system should be minimal. Any scour potential should be limited by the cohesive nature of the canal banks (constructed to minimize seepage) and vegetative cover above the waterline. Additionally, the canal system will function as a series of pools, between check structures, except when at peak capacity. Average canal velocities at peak capacity will be 1.6 feet per second or less. With a limited sediment load being transported within the canal system, the potential for significant sediment inflows into the natural streams would be very minimal.

Comment 3. What will be the impacts on water quality from six years of construction?

Response 3. The project will be constructed in phases that should have little effect to existing water quality. Water quality will be monitored during project construction and operation. Erosion control measures will be incorporated as a construction practice.

Comment 4. How will maintenance be performed and who is responsible for maintenance?

Response 4. The White River Regional Irrigation Water Distribution District is responsible for operating and maintaining the project. Volume 1, the Main Report, provides the operation plan on page 82 and the operation and maintenance requirements on pages 83-85. The estimated annual maintenance costs are included in Table 10 on page 87.

II. Arkansas Department of Parks & Tourism
One Capitol Mall
Little Rock, Arkansas 72201

Comment 1. We concur with the comments submitted by the Arkansas Game and Fish Commission in their letter of February 22, 1996, concerning the possible impacts on fish and wildlife resources and would also say that the public recreational possibilities for this project should be explored further. With the number of miles of canals that would be built, we would think there would be some opportunities for public access where these waterways crossed public lands, such as highway right-of-ways, for instance.

Response 1. Most features of the recommended plan are not conducive to recreation development; however, the local sponsor has stated a desire to work with other interests to pursue mutually desirable and cost shared recreation. Willingness to cost share is critical. The irrigation district would provide public fishing at sites they own as safety allows.

Comment 2. We were disappointed to see the comment in paragraph 1.13 of the Draft EIS summary that "recreational development is a low budgetary priority under current Corps policy." That comment is difficult to understand from the nation's leading provider of water based recreation and the nation's second leading provider of all recreation. Recreational benefits were used in the cost benefit analysis for this project, yet the Corps acts as if they have no responsibility for helping to manage it. This is especially disturbing in light to the language in Section 208(a) of the Water Resources Development Act of 1996, which directs the Corps to provide increased emphasis on, and opportunities for recreation at water resources projects operated, maintained or constructed by the Corps of Engineers.

Response 2. Most recreational opportunities provided by the Corps are associated with reservoir operation. In these cases where multiple recreational opportunities are provided, the Corps controls access to the areas. Such is not the case with this project where access to canals and storage reservoirs is controlled by adjacent landowners. However, as stated in Response 1, the sponsor is willing to provide access at sites they own where access can be

safely made and to work with others to increase public access.

- III. Arkansas Geological Commission
Vardelle Parham Geology Center
3815 West Roosevelt Road
Little Rock, Arkansas 72204

Comment 1. One concern, however, is that there is no mention of any assessment of earthquake hazards in the design of the main pumpage station near DeValls Bluff, Arkansas in Volumes 1 and 9. The structure is to be located on the White River floodplain atop 20 feet of fill. Such a placement and construction could cause foundation failure during a major earthquake in the region. Also, earth levees and dikes built above the surrounding land level could fail, especially during periods of heavy rainfall.

Response 1. Earthquake was addressed in Appendix B, Engineering Investigations and Analysis, Volume 4, Section II, Para. 2.09b. An analysis of the proposed site of the major pumping station (1640 cfs) was undertaken to determine the annual risk factor (R_t) for an earthquake to cause liquefaction of the underlying foundation sands. This analysis is shown on Plates II-20 and II-21. The analysis was controlled by the sand layer at Elevation 128.0 feet NGVD (44 feet from the surface) of Boring 2-EAPSU-94. This risk factor was determined to be equal to 0.000823 for existing conditions. The pumping station foundation is 36 feet below natural ground, however the ground around the station was raised in order to provide access to the station that is above a 100 year flood. Although earthquake analyses were not specifically performed for the canal levees, the analyses performed were very conservative and will be adequate for an earthquake loading condition. The canal levee embankment design resulted in a minimum factor of safety of 1.35 for the after construction loading case assuming very conservative conditions (See Plate II-17). An embankment with an after construction factor of safety of this magnitude will have a factor of safety in excess of 1.0 for earthquake loads.

- IV. Arkansas Department of Health
4815 West Markham Street
Little Rock, Arkansas 72205-3867

Comment 1. The cities of Carlisle, Hazen, DeValls Bluff, Ulm, Stuttgart, DeWitt have water and sewer mains in the project area. The city of Des Arc and the Grand Prairie Regional Water Distribution District have water mains in the project area.

Response 1. Concur. Planning for the project included identifying necessary relocations to maintain utility service throughout the project area. Where necessary, utilities will be relocated to maintain service.

Comment 2. Plans and specifications for the relocation of any water or sewer mains should be submitted to and approved by this office prior to commencement of construction.

Response 2. Concur. The local sponsor is responsible for project relocations. During preparation of plans and specifications, a right-of-way map will be furnished to the sponsor for each item of work. This map will include the necessary relocations. The sponsor will work with the facility owners in coordination with your office to ensure that the relocations are preformed in an acceptable manner.

Comment 3. Funding of this project will need to include monies for the relocation of water and/or sewer mains and services.

Response 3. Concur. An estimated cost of all relocations is included in the total project cost with \$4,379,000 included for utility relocations. Utilities at 342 locations will be impacted by the project. A brief description is given in Volume 1, Main Report, on page 76, and the facility inventory and cost estimates are provided in Table III-B-1 in Volume 5, Appendix B, Section III, General Engineering and Relocations.

V. Wildlife Management Institute
110 Wildwoods Lane
Lawrenceburg, TN 38464

GENERAL COMMENTS

Comment 1. Although the GPADP is the only currently authorized project, it is one of five irrigation projects proposed as part of the overall Eastern Arkansas Comprehensive Project. Two other irrigation projects being considered would withdraw water from the White River, one would withdraw from Bayou Meto and one would withdraw water from the Little Red River. We urge the Corps to include an assessment of the potential cumulative impacts of all irrigation projects being considered in the Eastern Arkansas Region Comprehensive Study in the Final EIS. Due, in part, to a long list of government and private water related projects in eastern Arkansas, some tremendous problems have developed. This creates a serious need to study cumulative effects of all proposed projects involving water resources. Such studies may aid in preventing some additional serious, long-term problems.

Response 1. A section has been added to the FEIS that addresses cumulative impacts of other potential irrigation projects (i.e., Little Red River, Black River) on the White River basin. Environmental monitoring programs for the GPADP will be designed and implemented with input from natural resource agencies. Any future study would analyze impact considering existing or authorized projects in place. However, at this time, the only planned, funded, or authorized project utilizing the White River or its tributaries excess water

is the Grand Prairie Project. Also, the White River Navigation to Newport, Arkansas, General Reevaluation is quantitatively evaluating cumulative impacts associated with it and the GPADP.

Comment 2. On page 5 of the GRR it is claimed that “this document is of sufficient detail and content to serve as a basis for proceeding to design memoranda, as needed, and plans and specifications for project construction.” We disagree with this statement and will identify some of our major concerns. Our review concludes that both the GRR and DEIS are incomplete and inadequate according to requirements of the National Environmental Policy Act. These documents indicate that many major project decisions concerning development, operation and maintenance agreements between the Corps of Engineers, Natural Resources Conservation Service and the White River Regional Irrigation Water Distribution District (WRRIWDD) (non-federal sponsor) have not been made. We will identify some of the indecisive situations in this letter. Because of the absence of some important specific details and/or the lack of disclosure of important features of the plan, we were not able to arrive at fully informed conclusions on all elements of interests to us.

Response 2. Alternative analyses have been conducted to determine the selected plan which has substantial national economic benefits, minor environmental impacts, and substantial environmental benefits. Project benefits and impacts have been fully investigated and considered. Outstanding questions center on the division of plan responsibilities, not the plan itself. The plan will be operated and maintained by the local sponsor. Division of responsibilities, which will be specified in the project cooperation agreement, will not affect the impact assessments or project feasibility.

Comment 3. Of particular interest to us is project related impacts on wildlife and fish in the GPADP. Unfortunately, with the exception of fish, the documents included few specifics about such impacts. We recognize that this results partially from the widespread intensive agricultural land use of the project area. However, the documents included many claims for project induced benefits to waterfowl and waterfowl hunting. Yet we could locate no specific plans for waterfowl and we understand that none exist.

Response 3. Studies were conducted to evaluate potential impacts to wildlife habitat and wetlands. Biologists from the Memphis District, Arkansas Game and Fish Commission, and U.S. Fish and Wildlife Service (USFWS) collected field data for use in Habitat Evaluation System (HES) and Habitat Evaluation Procedure (HEP) evaluations. The Memphis District conducted a HES analysis to calculate project-induced habitat losses; the USFWS independently performed a HEP analysis in order to estimate wildlife habitat impacts. Results of the HES analysis were presented in the DEIS; and the HEP results were summarized in the Fish and Wildlife Coordination Act Report contained in Volume 9, Appendix C, Section VI, Part A.

A multi-agency team led by the Arkansas Natural Heritage Commission and Natural

Resources Conservation Service, with participation by the Arkansas Game and Fish Commission, USFWS, Memphis District Corps of Engineers, and the Arkansas Highway and Transportation Department (AHTD), conducted a study to assess impacts of water withdrawals from the White River on wetlands and bottomland hardwood forests within the floodplain. This study was conducted on the floodplain west of Clarendon, Arkansas, in the White River National Wildlife Refuge. Results of this study are summarized in the DEIS.

Malacologists, Dr. John Harris (AHTD), Dr. Paul Heartfield (USFWS), and Dr. Andrew Miller (U.S. Army Waterways Experiment Station) were consulted regarding potential impacts to mussels within the White River and the need for a quantitative impact study. It was concluded that the minor reductions in surface water elevations of the White River should not cause significant impacts to mussels and that no quantitative impact assessment was necessary. In addition, the Memphis District funded a USFWS mussel survey of LaGrue Bayou; this survey was led by Dr. Heartfield. This survey revealed that only low-density populations of mussels exist in LaGrue Bayou; the USFWS informed the Memphis District that no additional surveys were necessary for the purpose of assessing impacts to mussels within tributary streams.

The Memphis District did not ignore potential impacts to either fish or wildlife. Regarding the waterfowl plan, see our response to Comment 6.

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Comment 4. Page 19. Meteorology. The average annual rainfall for the project area is described as approximately 49 inches with the distribution by months listed. It is claimed that “This distribution does not correlate to the timing of water needs for agriculture.” This is an incorrect statement and should be excluded. Numerous farms are successful in the project vicinity with this amount of rainfall and distribution. Certainly farming in the area may be more productive with irrigation water, however this also comes at high economic and environmental costs.

Response 4. The distribution of rainfall does not in fact correlate to the timing of water needs for agriculture. Crop season traditionally falls in the months from May to October. If an examination of the monthly mean rainfall amounts presented in Figure IV-A-02 is conducted, approximately 45 percent of the annual average rainfall will fall between November and March. Perhaps the “timing of water needs” should have been stated “timing of water requirements.” While dryland soybean production can take place utilizing only rainfall, the area’s rice and aquaculture production cannot continue without supplemental irrigation water. Even soybean production is more profitable and a better use of the area’s valuable resources under irrigation as shown in the crop budgets presented in the Economic Appendix (Tables D-II-5 and D-II-6). These budgets account for all economic costs associated with both dryland and irrigated crop production.

Comment 5. Page 21. Fisheries. The White River is identified here, and in other sections of the project documents, as having high quality fisheries. According to the GRR, 243,900 acre-feet of water per year will be pumped from White River to irrigate crops during the growing season. To benefit waterfowl, the documents claim that water would be pumped in the fall/winter season from the White River onto 38,525 acres at an average depth of 4 inches beginning in October. The proposed pumping would follow the driest period of the year (July, August, September and October - page 19, GRR). What effect will this have on the White River fishery during the lowest flow of the year during years of low rainfall? What effect will pesticides used on agricultural lands have when irrigation runoff reenters streams, especially during low stream flow periods? What effect may this have on White River National Wildlife refuge and other public lands located downstream of the project area? The GRR (on page 21) explains that desiccation during summer has an adverse effect on fisheries in tributary streams. Other studies referenced in the documents claim that the water removal from the White River will not have a significant adverse effect on the fishery. The tremendously valuable sport and commercial fishery of the White River deserves exceptional protection.

Response 5. The aquatic evaluation determined that impacts on pumping of fish habitat during the low water season (July - October) would be minimal or non-existent. Furthermore, pumping would cease once river stages reached the minimum flow requirements identified in the Arkansas State Water Plan (ASWP). Existing water quality should not be affected by the project. The water quality of the area is governed by current water management practices and the project should not have any adverse impacts. Most of the tributary streams are small (width < than 50 feet), and some reaches become dewatered. Thus, additional water from the White River will increase the habitat value of the tributaries. "Desiccation" is not an issue in the White River, which has an average annual discharge of approximately 30,000 cubic feet per second, and pumping would cease once river stages fell below the ASWP minimum flows. The aquatic evaluation concluded that even a maximum reduction of one foot during pumping will not have adverse impacts on White River fishes.

Comment 6. Page 45. Flooding for Waterfowl. This section identifies a major need for additional waterfowl feeding and resting areas in eastern Arkansas. A claim is made that a waterfowl habitat plan was developed by a coalition of agencies and private interests. The stated goal of the plan "was to annually flood 45,000 acres of harvested fields and annually manage up to 30,000 additional acres to impound rain water." Required flooding depths were estimated to be "an average of 4 inches." According to the GRR, a "joint venture" project to accomplish these goals was developed under auspices of the North American Waterfowl Management (NAWMP). This claim was repeated on page 77 for the selected plan (Alternative 7B). Here it is claimed that 38,529 acres of harvested rice fields would be flooded on an average annual basis from 1 November to 28 February to provide 22,385,349 duck-use days annually.

After thorough review of all GPADP project documents, we could not locate a

waterfowl plan of any kind for the specific project area. I serve on the NAWMP Lower Mississippi River Joint Venture Board and I do not recall ever learning about a NAWMP joint venture project for the GPADP. We contacted your office, the Fish and Wildlife Service and the Arkansas Game and Fish Commission to inquire about a specific waterfowl plan for the GPADP. We were advised that, indeed, no specific waterfowl plan or NAWMP "joint venture" project has been developed for the GPADP area. We urge that either a specific waterfowl plan be developed or that all references to such a plan be removed from all project related documents.

Response 6. It is true that no joint venture agreement has yet been signed or executed for the project area and that the waterfowl plan is still being developed. Like all other major project features, plan development is on-going. It may have been premature to have referred to the plan in the main report as a "joint venture project" since an agreement has not yet been signed, but it is appropriate to refer to the plan development as a "joint venture effort." Waterfowl biologists from the Arkansas Game and Fish Commission, Ducks Unlimited, U.S. Fish and Wildlife Service, National Biological Service, and Ducks Unlimited have participated in this effort. The Memphis District and the White River Regional Irrigation Water Distribution District (WRIWDD) are committed to finalizing a plan to flood over 38,000 acres of harvested rice fields (on an average annual basis) for waterfowl. We will continue to work with natural resource agencies and organizations to finalize the plan. We are confident that this final plan will be acceptable to these natural resource organizations and that a formal joint venture agreement will be executed. The Memphis District and the WRIWDD will not abandon the waterfowl plan, and the waterfowl plan will be implemented. The cropland flooding for waterfowl will be incorporated into the operations manual and will be referenced in the project cooperation agreement, the contract between the Federal Government and the project sponsor for construction, operation, and maintenance of the project.

Comment 7. Page 87. Table 10. This table identifies annual waterfowl benefits of \$473,000. This sum was used to arrive at the project benefit-to-cost ratio. Assuming that there is no waterfowl plan, how was this sum developed?

Response 7. The \$473,000 figure is an average annual equivalent (AAE) value. An AAE value is the sum of the present value of the benefit stream expected to occur over the life of the project, plus any benefit expected to occur during project construction, which is discounted over the project life. The derivation of this figure is presented in Table D-II-17 of the draft GRR. The present annual waterfowl benefit is calculated to be \$449,480. It is estimated that 17,400 acres of harvested cropland is flooded annually each winter for waterfowl. On an average annual basis, the project would provide an additional 21,129 acres of flooded cropland for waterfowl. Using harvest data and hunter effort data developed for Arkansas, it was estimated that the waterfowl feature would annually provide an additional 15,023 hunting man-days. According to Engineering Regulation 1105-2-1090 and Corps Economic Guidance Memorandum 97-3, the value of a waterfowl hunting man-day was

determined to be \$29.92. Therefore, it was estimated that the waterfowl feature would provide \$449,480 in annual benefits. The \$473,000 in annual benefits can not be realized without implementation of the waterfowl feature. However, economic justification of the project is not dependent on the waterfowl plan. With the waterfowl plan the benefit to cost ratio is 1.24 to 1; the benefit to cost ratio without the waterfowl flooding would be 1.22 to 1.

Comment 8. Page 88 and Table 11. The text on this page and table 11 states that “38,525 acres of cropland will be annually flooded to benefit waterfowl” as one of the measured effects of the plan. Again there is no specific plan or other information that we can locate which will allow anyone reviewing the GRR, DEIS or Appendix C-Environmental document to understand this claim. For example, specifically where are the private land acres that will be flooded? How much will the pumped water cost? Who will pay for the cost of the pumped water? Who will pay landowners to repair the many miles of rice field levees so that they will hold water on the fields? Have sufficient numbers of private landowners agreed to allow for 38,525 acres to be flooded from 1 November to 28 February? What types of agreements will be made with private landowners for flooding rights on their fields? If a plan with these specifics or any specifics concerning wildlife exist for the proposed GPADP project area, please furnish us a copy for review. Also, please include any such plans as an integral part of the final GRR and EIS.

Response 8. The addition flooding for waterfowl will be incorporated into the operations plan and referenced in the PCA. This feature will also be incorporated in the contractual document between the NRCS and the landowner. The local sponsor will be required to operate and maintain the project in accordance with the operations plan. Area farmers currently flood harvested rice fields for waterfowl. The repair of the rice field levees is currently an established and ongoing practice in the management of rice stubble. The practice is to roll or flatten the rice stubble. Then the levees are repaired to catch fall and winter rainfall, which causes the stubble to rot or decay. An additional benefit is the decaying rice stubble increases invertebrate production which provides a valuable source of protein for waterfowl. The following spring any remaining residue will be much easier to manage. The project will provide water to flood the fields in a timely manner and at depths sufficient for waterfowl habitat. Only an alternate source of irrigation water can provide the necessary depths in a timely manner.

Comment 9. Pages 85 and 100. It is explained on pages 85 and 100 that Section 103(j)(1) of the Water Resources Development Act of 1986 mandates that “Any project to which this section applies (other than a project for hydroelectric power) shall be initiated only after non-Federal interests have entered into binding agreements with the Secretary to pay 100 percent of the operation, maintenance, and replacement and rehabilitation costs of the projects...” Have the non-Federal interests agreed to pay for the total costs of the entire project, including the operation and maintenance of reconstructed rice field levees and pumping water to flood 38,525 acres to an average depth of 4 inches from 1 November through February 28 for

waterfowl habitat? If so, please include specific information of such agreements in the final GRR and EIS.

Response 9. The non-Federal sponsor has indicated a willingness to sponsor the project. A Project Cooperation Agreement (PCA) will be negotiated with the sponsor prior to the initiation of construction. This agreement will meet the requirements of Section 103(j)(1) of the Water Resources Development Act of 1986. The PCA also includes a requirement that the project be operated in accordance with the operation and maintenance plan developed for the project. This plan reflects the analyses presented in the report and EIS including the waterfowl flooding. However, Corps policy is to not execute the PCA until the report and the ROD on the EIS has been approved.

Comment 10. Page 102. It is further explained on page 102 that:

“At this stage of project development, it was **assumed** that there would be an agreement with the Natural Resources Conservation Service (NRCS) to implement on-farm features. This includes all conservation measures, management strategies, and retrofit of existing irrigation systems to utilize the delivery system. This component also includes provisions for **providing waterfowl feeding and resting areas during the fall and winter months**. As the project further develops, implementation and operation and maintenance of on-farm features may follow a different approach” (emphasis ours).

We assumed that this refers to the 38,252 acres to be flooded for waterfowl habitat. If we are correct, has NRCS developed plans for the on-farm features? If so, please furnish us copies of the agreements and plans. Importantly, these should be included in the final GRR and EIS. The text on page 102 indicates that there may be confusion concerning responsibilities and authorities.

Likewise, a letter dated June 12, 1998 to Colonel Bean from Tommy Hillman (WRRIWDD) and included in the GRR (inserted following page 110) indicates more confusion of responsibilities. This letter states, in part, that:

“...before we can finalize the details of our Financing Plan and enter into Project Cooperation Agreement (PCA), many issues involving Federal participation in the project must be resolved. The most significant issues concern the extent of Federal participation in individual project features such as the on-farm component of the project and the development of appropriate ability to pay cost share guidelines as provided by current Federal law. Until these crucial issues, which directly affect the non-Federal share, are resolved it is impossible to produce a detailed Financing Plan.”

Because these “on-farm components” and federal-state-local financial responsibilities are an essential part of the plan, we contend that these should be completed and circulated to all interested reviewers for comments prior to completion of the draft GRR and DEIS.

Response 10. The NRCS has developed draft farms plans for 10% of the farms in the project area for planning purposes to assess their costs, impacts, and benefits. This level is sufficient for feasibility level design, cost estimating, and analyses. Detailed designs will be accomplished prior to construction. The issues discussed in Mr. Hillman's letter are cost sharing policy issues within the Corps of Engineers. These issues are described in the main report on page 100, Ability to Pay, and on page 103, Cost Apportionment. These issues are with the role the Federal Government would play in sharing the costs of the plan and do not effect the impacts of the recommended plan. The Federal Government will not execute the PCA until the EIS is processed.

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Comment 11. EIS-2 and 3. It is explained here that one of the reasons for selecting Alternative 7B as the tentative selected plan is that it "provided additional waterfowl habitat." We repeat our previous concerns that we can locate no specific waterfowl plan for the GPADP, or any official who knows that such a plan exist. Because there appears to be no specific waterfowl plan, as claimed, we submit that the DEIS is incomplete and not adequate in accordance with the National Environmental Policy Act.

Response 11. Again, development of the waterfowl plan is on-going. The plan includes acres, techniques, and components to achieve the waterfowl benefits. Although specific details for implementation need to be completed, the Memphis District and WRRIWDD are committed to finalizing the plan and signing a formal joint venture agreement. As stated in Response 6, the waterfowl plan will be implemented with or without any other assistance. The PCA will bind the sponsor contractually with the Federal government to operate the waterfowl features. The plan is adequately described in the DEIS.

Comment 12. EIS-4, 1.13. It is explained here that the Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service have expressed concerns that the project, as designed, would not provide sufficient recreational opportunities to the general public. The Wildlife Management Institute supports these concerns. Because the project is projected to cost taxpayers \$271 million, and because the irrigation water to be pumped from the White River is a public resource that is intended to be used by private landowners, we contend that an equitable amount of land should be open to the public for hunting, fishing, birding and other forms of compatible outdoor recreation. Such lands should be specifically identified and agreements made for their use before final legal agreements are completed between the Corps, NRCS and WRRIWDD that would allow the proposed project to begin. Because of the emphasis on waterfowl management, waterfowl hunting and fishing in the project documents, we were surprised to read on page EIS-5 that "recreational development is a low budgetary priority under current Corps policy.

Response 12. See Response 1 to the comments from the Arkansas Department of Parks and Tourism. Recreational development is currently a low budgetary priority. Recreational

development must be secondary to the development of other project features. For example, the waterfowl plan was conceived primarily for the provision of additional waterfowl habitat; recreational hunting would be a secondary benefit. A habitat impact analysis revealed that 436 acres of cleared land must be acquired and reforested in order to mitigate project-induced losses to wildlife habitat. This land could be open to public recreation at the discretion of the managing agency.

Comment 13. EIS-12. Without Condition. Was it considered in this alternative that many landowners could convert from water intensive rice farming to other crops such as soybeans and corn that need much less water? The information in the GRR and DEIS was not sufficient for us to know if this was considered. Currently, more than 60 percent of the farmers in the project area farm soybeans, corn and grain sorghum which require less water. The tremendous amount of water used for rice crops have created the ground water shortage and the need for stream water for irrigation. Strict water conservation and conversion to crops which require less water could help reduce dependence on large volumes of water. Meters could be place at appropriate locations to help enforce water conservation. We believe an alternative should be considered that requires less water for the DEIS to be considerate adequate in accordance with the National Environmental Policy Act.

Response 13. Alternatives which require less water were considered. Several were eliminated during the initial screening process and not included in the final array of alternatives. The alternative consisting of only on-farm measures is presented in Volume 10, Appendix D, Section III and the Main Report. This alternative (Alternative 3A) was a cost-effective way to increase or extend the area's water supply and it was economically justified. However, it did not meet the area's needs and could not provide protection of the area's aquifer. It was also not the National Economic Development (NED) plan or the plan which maximizes net economic benefits to the national economy. Since it was cost effective, its features were included in other alternatives which also provided supplemental sources of irrigation water.

The comment suggests that an alternative forcing the area's farmers to shift from rice to irrigated soybeans should be developed. This would be at best a short run solution, which may extend the aquifer's life somewhat. Wholesale shifting from rice to irrigated soybeans will still deplete the area's alluvial aquifer. Even if this alternative could be implemented, it would not be economically feasible. Rice uses approximately twice the water of soybeans while generating approximately twice the net farm income per acre of soybeans using the commodity prices required by current guidance for analyzing water resources projects. Current market prices widen the gap between rice and soybeans. Therefore, the area's farmers could not be expected to shift from rice due to economic reasons. Rice is simply a more profitable use of their available water.

Comment 14. EIS-12. Plans considered. Please include in the final EIS a brief explanation of why the majority of landowners in the southeastern section of the original project area

opted not to participate in the project.

Response 14. A review of current well data and recharge rates for this area indicated that this area was not ground water critical and would not benefit substantially from the project. After a review of this data by the USGS, ASWCC, and the National Water Center, the irrigation district concurred with the area's request and the area was removed from the project area.

Comment 15. EIS-15, 4.17. Management for waterfowl on project area cropland is again claimed here as being under auspices of the North American Waterfowl Plan. Please review our previous statements concerning this matter. Someone may have voiced such a need, but we cannot locate such a plan. In any case, voicing needs does not translate into on the ground realities in the Grand Prairie Area project.

Response 15. See Response 6.

Comment 16. EIS-25 and EIS-71. Wildlife. A stated impact of Alternative 7B, the tentatively selected plan, is "flooding 38,529 acres of harvested rice fields would provide an additional 12,275,949 duck-use-days per year." See our previous statements concerning this claim and include specific plans, if available, in the final project documents. If there are no specific plans, then beneficial project impacts would be much less for waterfowl.

Response 16. See Response 6.

Comment 17. EIS-27. Recreation. It is stated here that Alternative 7B "would annually provide 28,769 man-days of waterfowl hunting and \$860,760 in related expenditures." See our previous comments and please specify what specific wildlife planning document includes this information.

This proposed GPADP project is certainly a reversal in purpose when compared to other Corps of Engineers and Natural Resource Conservation Service (NRCS) projects. For the past fifty years the Corps and NRCS have developed numerous projects designed to remove or hold water off croplands. Many thousands of miles of streams have been channelized by both agencies to drain wetlands and to reduce flooding on agricultural lands. Specifically within the Eastern Arkansas Region Comprehensive Study area, hundreds of miles of streams have been channelized and ditches dug to drain wetlands and eliminate water from the land surface. Without a doubt these projects have contributed the reduction of aquifer recharge. Now, the agencies have come full circle and are proposing to pump water from streams to irrigate fields because of serious declines in aquifer water resources. Indeed, this is an unbelievable turn of events.

The Wildlife Management Institute believes that a project could be designed that would better serve the long-term interest of our nation. Such a project would include

conversion to agricultural crops that require less water than rice, conservation of water resources, conservation tillage and rice acreage in balance with aquifer recharge.

We also believe strongly that no taxpayer-funded project to help solve the situation described in the GRR should be approved without a specific wildlife component. Provisions explained in the GRR and DEIS to flood 38,529 acres should be made available for public use for hunting, fishing, birding and other outdoor recreational needs. Some of the acres should be established as waterfowl resting with no hunting allowed.

We urge that specific plans to accomplish the wildlife component be developed and agreed to by the Corps of Engineers, NRCS, WRRIWDD, U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission prior to completion of the GPADP plan. The wildlife plan should include the specific areas to be included, water management agreement for fields to be flooded, hunting agreements, acres for waterfowl resting, agreements for specific landowners to restore rice field levees to hold water on fields from November 1 through February and signed legal agreements with all specific landowners involved in the plan. All of the wildlife component agreements should be made prior to completion of GPADP project plans and should be required to be implemented on the same schedule as any water import project components are implemented.

Response 17. The planning for the Grand Prairie Area Demonstration Project was accomplished to identify the current and future water resources problems and opportunities in the region. The plan developed contributes to the economic development of the nation and prevents regional catastrophic economic losses. Environmental features were developed in concert with natural resources agencies and included in the plan. The waterfowl plan is identified as a project feature in the DEIS, and it therefore must be implemented by the sponsor as part of the PCA. Additional features for aquifer protection and waterfowl conservation are being developed for incorporation into the project. The local sponsor is pursuing additional recreational measures as opportunities arise. The section of main canal just downstream of the pumping station is being examined to include additional environmental and recreational features.

The suggested alternative was developed and used as the basis from which to measure project benefits and costs. It is the set of conditions expected to occur in the future without a project. It could be referred to as the "No Action Alternative." The primary assumption made in the analysis, for both without- and with-project conditions, was that all available irrigation water would be used as efficiently and cost-effectively as practical. Future without-project conditions reflect the land use balanced with the available recharge as was suggested by the Wildlife Management Institute.

- VI. Ducks Unlimited
Southern Regional Office
193 Business Park Drive, Suite E
Ridgeland, Mississippi 39157

Comment 1. The project will affect a portion of the White River designated as a RAMSAR Wetland of International Importance. This designation is reserved for wetlands meeting certain environmental criteria making them truly worthy of international recognition. Designation also is intended to limit unnecessary alternation. We understand the need for water on the Grand Prairie for crop irrigation and appreciate that withdrawals will be timed to minimize impacts to White River flows. Nonetheless, we caution that this project constitutes an alteration to an internationally recognized wetland system. We also offer concern about the cumulative effects of this and other projects including the dams on the upper White River, the new Montgomery Point Lock and Dam, other irrigation projects planned upstream of the Grand Prairie project, and the potential White River Navigation Project. We urge caution and encourage you to coordinate very closely with state and other federal conservation agencies and the public as you plan these projects. We are confident that you will make efforts to avoid and minimize negative impacts to this important wetland system.

Response 1. Impact analyses concluded that the project would not have significant adverse impacts to the White River or associated wetlands. However, post project monitoring programs will be established to determine if the project is functioning as predicted. The hydraulic impacts associated with the Montgomery Point Lock and Dam were examined, and it was determined that the hydraulic impacts of the two projects did not overlap. Also, the cumulative impacts of the Grand Prairie Area Demonstration Project are being incorporated into the White River Navigation to Newport, Arkansas, General Reevaluation. A cumulative impacts section has been added to the FEIS to address impacts of other potential projects on the White River basin.

- VII. Rose Law Firm
120 East Fourth Street
Little Rock, Arkansas 72201-2893

COMMENTS ON NAVIGATION

Comment 1. The fundamental Project assumption is that the White River has sufficient excess water. The Draft Report is based on the Arkansas State Water Plan (sometimes referenced herein as "ASWP"), completed in 1986, and reflects water flow data from 1940-1986. While the Draft Report acknowledges that more recent water data exists, the Draft Report's conclusions are not based on the more recent data, but are based on the 1986 Arkansas State Water Plan and dated water flow data.

The governing DEIS regulations note that accurate scientific analysis is “essential to implementing {the National Environmental Policy Act}. “ ” Most important, NEPA documents must concentrate on the issues that are truly significant...” The DEIS’s failure to analyze current data is unexplained and unexplainable. Such data, is now available, and must be included.

The Draft Report’s construction schedule provides that Phase 1 of the Project is the pumping station. Under governing law, water may be pumped out of the river only if there is an excess and if navigational needs are met. Current data regarding water flow data is unreviewed by the Corps. In addition, no state permit for a water transfer has been issued.

Also, as noted in Comment 3, in order to assess and project the potential damage to navigation, all parties must know the level at which pumping will cease. The Corps states the cutoff levels are the ASWP minimum stream-flow levels. It is unclear, however, how these levels will be enforced and monitored. Allocation plan levels for the White River have yet to be finalized by the State of Arkansas. How will the Corps ensure ASWP cutoff levels are mandated, followed and enforced?

The White River has become a large source of aquifer replenishment, reversing historical trends. No analysis is done regarding whether the tremendous current aquifer replenishment demands on the White River (on average) in recent years have affected the amount of any excess White River water. In addition, no analysis is included regarding how current recharge to the White River will be affected by reduced flows.

In sum, the current availability of White River water to support the Project is unknown. Analysis is premature for a pumping station where there is no authority to pump. Such an advanced schedule is inconsistent with the many important Project requirements still left to be reviewed and predates the permit and allocation plan required under Arkansas law, but currently nonexistent.

Response 1. At the time the analyses were conducted, the most recent available data from the super model that simulates homogeneous synthetic period of record to simulate the past flow conditions on the White in current reservoir operations. Due to length of the period of record and the motecarlo simulation used during our analyses, extending the period of record to the current data would not make any appreciable changes.

The 1986 Arkansas State Water Plan is the basis for determination of allocation limits and permit issuance. The ASWCC is the state agency which has jurisdiction over implementing the provisions of the water plan. The Water Plan minimum stream flows were used in the analyses of the costs, impacts, and benefits of the selected plan. These cutoffs are provided in Volume 3, Section I, Part D-(4), pp. IV-19 thru IV-21. These cutoffs were the basis of all analyses and the basis for the NEPA compliance. These cutoffs will be

included in the operation plan that is referenced in the Project Cooperation Agreement (PCA). The PCA is the contract between the Federal Government and the project sponsor governing the project. The PCA gives the Federal Government the right to enter onto project lands to insure that the project is being operated and maintained in accordance with the operations manual and also gives the government the right, without relieving the sponsor of the responsibility, to operate and maintain the project.

Comment 2. In 1995, Arkansas law was modified, further restricting the transfer of excess surface water in the White River Basin. While the White River was intended to be a beneficiary of this 1995 legislation limiting the amount of monthly withdrawals, no analysis is given in the Draft Report regarding the effect of this 1995 legislation on the 1986 Arkansas State Water Plan or on current conditions.

Response 2. 1995 changes to Arkansas law provided the ASWCC extensive authority to determine if "excess surface water" exists in particular streams. Under previous law ASWCC could authorize only 25% of the amount available from any watershed on an average annual basis. A specific provision added in 1995 to the White River Basin was limiting the transfer amount on a monthly basis to an amount which is 50% of the monthly average of each individual month of excess surface water. These monthly values were analyzed for the Grand Prairie Area Demonstration Project and were determined to have no effect on previous analyses.

Comment 3. The DEIS includes detailed analyses only under pump cutoff levels set at the 1986 Arkansas State Water Plan minimum levels. Similarly, the DEIS includes only monetary effects based on ASWP pump cutoff levels.

Unless assurances are provided that the cutoff levels of the Arkansas State Water Plan will be enforced by the Corps, the White River Regional Irrigation Water Distribution District ("Irrigation District") and the Arkansas Soil and Water Conservation Commission ("ASWCC"), there is a grave potential for possible conflict. An example of such a federal/state conflict is evidenced by the ASWCC's Draft Allocation Plan, which could be interpreted to allow pumping under a worst case scenario to levels far lower than under the Corps' ASWP levels.

In meetings with Corps' representatives on September 24, 1998, Bunge was advised and assured that the ASWP would provide the mandated, operative pump cutoff criteria as part of the governing Project Cooperation Agreement ("PCA"). (See comment 9). Such assurance was made because the Project reevaluation is based on the ASWP; the ASWP is the plan presented to Congress for funding; and the DEIS is based on the ASWP.

It is unclear how the Corps intends to bind the Irrigation District and ASWCC to the ASWP pursuant to a PCA. Unless this issue is resolved, one is unable to assess the potential impact on navigation under the Corps' proposal. Such an evaluation is impossible.

For instance, some of the questions presented are as follows:

- (a) If the Corps' plan is under the 1986 ASWP, how will the ASWP minimum streamflow levels be required?
- (b) What entity will monitor compliance?
- (c) How will compliance be enforced?
- (d) What court will have jurisdiction over compliance?
- (e) How will the Corps involvement and monitoring change when control of the Project is turned over to the Irrigation District?
- (f) What law governs if the ASWCC sets a worst case lower level for diversion shutoff under its allocation plan?
- (g) If the answer to any of these questions is that the Project Cooperation Agreement ("PCA") will control, what are the standards for entering, monitoring and enforcing a PCA under such conditions (See Comment 9)?
- (h) Will navigation interests be allowed to execute the PCA or a subagreement or otherwise be acknowledged as a third party beneficiary with the ability to rely on and enforce the PCA or subagreement?

Thus, the Corps should include an explanation of how the ASWP will be the governing, operating constraint.

Response 3.

(a) See Response 1 above. These cutoff levels will be the approved levels if the report is approved and will be the cutoff levels in the operation manual referenced in the PCA. Non-compliance with the operation manual gives the Federal Government the right, without relieving the sponsor of the responsibility, to operate and maintain the project.

(b) The Corps of Engineers will monitor and conduct periodic and annual inspections to ensure compliance with the operations plan and PCA. The State of Arkansas will be responsible for enforcing any permit that they may issue.

© The PCA will give the Federal government the authority to assume operation and maintenance to ensure that the operation plan and the PCA are followed.

(d) The U.S. Federal District Court will have jurisdiction over the PCA and NEPA compliance.

(e) When construction is complete and the project turned over to the sponsor to operate and maintain, the Corps will conduct periodic and annual inspections, and require that records be kept according to the operations plan to ensure proper operation and maintenance of the project.

(f) The cutoff levels presented in the GRR and analyzed for NEPA compliance will be the approved levels for the project set contractually between the Federal Government and the sponsor by the PCA. Actions by the ASWCC to lower minimum stream flows will not alter the operations plan in the report or analyzed for NEPA. However, the project does not relieve the sponsor of complying with state laws and permits.

(g) See Response 9.

(h) No, only the Federal government and the sponsor will be parties to the PCA. It is not the policy of the Corps of Engineers to name third party beneficiaries in PCA's with sponsors.

Comment 4. No mechanism, such as monitoring, is in place to ensure compliance with the Draft Report. Such monitoring is required in controversial cases and should include conditions in approvals and requirements for reporting results. Here the DEIS acknowledges that navigation effects are one of the three areas of controversy. No provision is made, however, regarding the result if navigation is affected in an unplanned way. In addition, no analysis is done regarding experiences with other water irrigation projects in other states, regarding reductions in river stages and effects on navigation, sedimentation and siltation.

Without monitoring and other protections, if projections are inaccurate, there could be irreversible commitments of the White River's resources. The DEIS should include mitigating protections in the event of unforeseen reductions in river stages. Such protections, at a minimum, should be that the Project will be reevaluated if the projections prove materially inaccurate.

Response 4. Gage data will continue to be monitored by the US Army Corps of Engineers. The operating plan will specify the sponsor log pump operation and gage data. The Corps has broad authority to conduct reevaluation of projects that are uncompleted and authority to investigate and correct design deficiencies on all projects. A monitoring plan will be developed and incorporated into the operations manual. Navigation impacts have been estimated and are presented in the report. These results have been coordinated with shippers and barge operators on the White River. Their assistance has been crucial in achieving the best estimate possible. Further, the impacts were estimated assuming no changes in the current dredging program would be made.

Comment 5. While Bunge is correctly noted as the major transporter on the White River, Bunge has been unable to interpret the Corps' data regarding moved tonnage. The Corps'

tonnage information is contrary to Bunge's shipping information. While the Draft Report reflects 544,000 tons shipped in 1996, Bunge's records alone reflect 655,000 tons shipped. Therefore, without considering any other shipper, the Corps' data understates actual tonnage shipped by at least 20%.

Response 5. The tonnage figures used in the analysis were compiled from information reported to the Waterborne Commerce Center for the years 1982 through 1993. These figures were the latest figures available when the analysis was conducted. The average annual tonnage shipped for these years was 453,500 tons. The 544,000 ton figure used in the analysis was 20 percent higher than the historical average reported to the Waterborne Commerce Center. It was also 15 percent higher than the annual estimate of 475,000 tons provided by Bunge in 1995. It was interesting to note in the latest information supplied by Bunge that the June shipments for 1996 increased dramatically. This should correspond to wheat shipments. In 1996, the state of Arkansas set a record yield per acre at 54.0 bushels per acre. Its total production was approximately 67.0 million bushels which approaches 1982's record of 72.2 million bushels. Total production for 1997 was down dramatically to 39.4 million. Based on the above, the conclusion can be drawn that the 655,000 tons shipped in 1996 was greatly influenced by the near record production in Arkansas and probably reflects record shipments on the White River. It would be imprudent to design projects or estimate the impacts of projects based on record or near record levels of shipping.

Comment 6. Bunge notes the Project operating plan prioritizes pipeline usage or water pumped from the White River over reservoir usage. The Draft Report contains an inadequate review of alternatives regarding use of stored water versus use of pipeline water. By prioritizing pumping from the river, additional analysis is needed regarding any environmental consequences, such as to recharge or such as from sedimentation and siltation because of increased maintenance needs.

Also, requirements for mandating conservation or promoting voluntary conservation measures should be included. This review is especially important because under Arkansas law, conservation can only be required if the area is designated "critical," and there are current legal challenges to such a designation in this area.

Such a detailed review of alternatives is consistent with NEPA policy and mandates. The NEPA process is to be used to identify and assess reasonable alternatives. All practicable means are to be used to avoid or minimize effects on the environment.

Response 6. A range of alternatives were formulated and alternatives analyses were conducted. The water from the pipeline must be used first and the stored water and groundwater used later. The project as designed cannot supply all needs through the import system. The stored water and groundwater must be saved for times when the import system cannot meet peak demands or for when import water is not available. This actually reduces the effects on navigation on the White River. If the project was designed to meet all needs

through import water, after the stored water and groundwater is exhausted, the import system would have to be much larger, requiring greater diversions and lower levels on the White during low flows.

Conservation is an integral part of the project and is required for the project to function as designed. If it is not built, the reliability of the project would be considerably less and many needs could not be met. The remainder of the project could not offset any loss in savings due to any decrease in design efficiencies. This portion of the project will be included in the PCA with assurances from the project sponsor that it will be built and maintained as designed.

Comment 7. The Draft Report concludes that navigation impacts will not exceed approximately a one foot decrease at any given time of the year. This assumption is based on pump cutoff levels set at the ASWP minimum. Under the Draft Report, it is not possible to ascertain how such levels will be monitored and enforced.

Even the projected, minimum one-foot decline can have significant, negative impacts on navigation. Such a one-foot decline also can have subtle impacts on navigation, including regarding the Corps' obligation or willingness to perform maintenance and dredging. Therefore, any change at the Clarendon gauge that has a direct impact on maintenance, indirectly affects navigation. Bunge was advised at the September 24, 1998 Corps meeting that the Project will not affect current Corps maintenance practices, notwithstanding the projected, one-foot decline. Such commitment should be incorporated into the Draft Report and PCA.

Recall, the one foot projected drop is based on pump cutoff levels tied to the ASWP. The ASWCC Draft Allocation Plan, however, places the worst case diversion cutoff level at 7,125 cfs at Clarendon for so-called "summer" months of June-November. Such a level would halt navigation. Bunge has utilized the White River during these "summer" months for many years.

(Table Omitted.)

As can be seen, June and July are heavy navigational agricultural shipping months. They are the primary shipping months for soft red winter wheat and old crop soybeans. Both the wheat and the soybeans are major Arkansas crops. In addition, November also is a heavy navigational agricultural shipping month, with new crops (soybeans, corn, milo and rice) having just been harvested. Therefore, the importance of the ASWP as part of the Corps' proposal is additionally highlighted.

Response 7. All of the analyses in the draft report are based on the current ASWCC Draft Allocation Plan. This plan uses a minimum flow of 9,650 CFS for the summer months. For other months, the flow is higher. All NEPA compliance and navigation impacts are based

on this plan. If the pumping station operates at flows less than 9,650 CFS, it will be contrary to the operating plan which is part of the draft report on which all NEPA compliance is based. These documents will become part of the PCA, which is the agreement between the project sponsor and the Federal Government for construction, operation, and maintenance purposes. Diversion of flows less than 9,650 CFS will be a deviation from all agreements between the project sponsor and the Federal Government and is contrary to all documentation used to gain NEPA compliance. Construction of the GPADP will have no effect on the level of navigation channel maintenance on the White River.

Comment 8. As noted by several of the other commentors, the governing regulations require that the DEIS be based on cumulative impacts. There are several irrigation projects proposed as part of the overall eastern Arkansas comprehensive project. Some of these projects would also draw water from the White River. It is critically important that a comprehensive study be made of cumulative effects of all proposed projects on the area's water resources.

Response 8. A section has been added to the FEIS that assesses cumulative impacts of other potential irrigation projects on the White River. The hydrologic impacts associated with the Montgomery Point Lock and Dam were examined in association with this project, and it was determined that the hydrologic effects of the two projects would not overlap. Also, post construction monitoring programs will be designed and implemented with input from appropriate natural resource agencies; actual effects on the White River fishery, floodplain wetlands, and water quality will be monitored. Furthermore, the White River Navigation to Newport, Arkansas, General Evaluation is quantitatively analyzing cumulative impacts associated with it and the GPADP. The other proposed irrigation projects that would utilize the White River are not currently authorized or being studied for authorization at this time. Any preauthorization studies for these areas would include assessment assuming the Grand Prairie Area Demonstration Project were constructed and operating in accord with the operations plan.

Comment 9. The Department of the Army, Corps of Engineers, Engineering Circular No. 1165-2-204 (July 31, 1997) addresses PCA elements for authorized projects proceeding in separable elements. Under the Circular, the PCA must be based on the Draft Report. Such Draft Report must address the requirements for operation; must address any unusual technical or policy aspects of the project or element; and must identify project cooperation requirements. "The Project Manager is responsible for insuring that the draft PCA is tailored to any unique aspects of the project authorization and the decision document and to reflect any special requirements of the sponsor that do not conflict with applicable law and Army policy."

"PCA provisions unique to the project or separable element should be simple and direct., since the decision document provides the necessary details." Subagreements may be entered with the third parties to enable the sponsor to meet its legal obligations.

On September 24, 1998, Corps representatives acknowledged that the PCA would require the sponsor (Irrigation District) to comply with the Draft Report and the DEIS. Therefore, under the Draft Report and DEIS, the 1986 ASWP would be the controlling parameter. As noted hereinbefore, Bunge asks that the Corps confirm its intentions and advise what specific language will be added to the PCA to address operational issues, including monitoring. Pursuant to the Circular's guidance, such simple and direct language could be as follows:

The Irrigation District (sponsor) acknowledges that notwithstanding any other state law or agency rule passed by the Arkansas Soil and Water Conservation Commission or any other state agency, the Project is only authorized to operate at pump cutoff levels set at the 1986 ASWP. The sponsor shall enter into a subagreement with the Arkansas Soil and Water Conservation Commission ("ASWCC") (the entity that may authorize a water transfer permit), with both parties committing to abide by the 1986 ASWP. The subagreement will establish an objective method of monitoring and enforcing compliance. Parties whose rights and interests are affected by sustained river flows shall be deemed third party beneficiaries of such subagreement, with the ability to enforce the subagreement in federal court.

Response 9. The draft PCA is currently being prepared. The PCA will include language to ensure that the pump cutoff levels are the levels set by the 1986 ASWP and analyzed for the benefits and impacts of the project. The operations plan presented in the GRR and evaluated in the draft EIS will be incorporated in the operations manual. However, the specific language must be negotiated with the sponsor and approved by Corps higher authority.

CONCLUSIONS

Comment 10. In summary, the Draft Report's and DEIS' analysis of navigation impacts is based on outdated data. The conclusions are based on pump cutoff levels that are much higher than current state diversion shutoff, allocation proposals. Each factor weights in favor of the Project and against navigation.

Response 10. These statements are incorrect. See Response 2. above. Impacts to navigation do not change with the provisions provided by the 1995 modifications to Arkansas Law. The Corps has been in constant communication with the ASWCC regarding the draft allocation plan. We are not aware of any plans which supersede the plan used in the Draft Report. If documentation of a more current plan can be provided, we will be glad to consider its effects. Until such time, the ASWCC draft allocation plan must be used since it is the latest documented plan available. The operation plan will use the cutoff levels in the ASWCC draft allocation and the sponsor will be contractually bound to these cutoffs through the PCA.

Comment 11. In addition, inadequate review time was given commercial navigational

interests, none of which were included in the distribution list of the DEIS. A 120 day extension period was requested. The Corps granted an extension period of only 15 days.

Response 11. The review time was in compliance with NEPA. Your request was the only formal request for an extension. The extension also included, in addition to the public meeting, a special briefing for Bunge with the Rose Law Firm represented to describe the project and any impacts to navigation. At this briefing all the major study disciplines were represented, presentations were made on the data contained in the report, and questions were fielded including specific questions concerning the cutoff levels and the PCA. Another briefing was given to the staff of the Arkansas Waterways Commission and the Commissioner from the White River to address potential impacts.

Comment 12. The scant attention paid to navigation is contrary to the Corps' primary mission. The Project's goals, however, do not include protecting or maintaining navigational interests. The Project's objectives are to provide water supply and maximize outputs.

Response 12. Extensive studies were conducted for the White River to assess all project impacts. Navigation and environmental impacts were evaluated for all features. The plan developed during the study maximized the national economic development benefits to the nation while protecting and preserving the vital natural resources in the region. The project's objective is indeed to maximize the Nation's outputs. Navigation is one of those outputs. In order to maximize outputs to the Nation, different uses of a resource must be balanced. In this instance, water is diverted from the White River's current uses to a more productive use, thus increasing the total national output. A detailed hydrologic and economic modeling of the project's effects on existing navigation was conducted with the results presented in the draft report. This effort used a 47-year period of record model, which compared historical White River flows under current channel conditions with current shipping data. Also included in the analysis were projections for future increases in tonnage expected to be shipped over the life of the project.

Comment 13. For all these reasons, the DEIS and Draft Report should be supplemented, because there is significant, relevant, current information bearing on the impact of the Project that remains unaddressed. The Corps has not rigorously explored and objectively evaluated all reasonable alternatives, such as a preference for reservoir usage over pumping from the River. In short, without sufficient analysis of current flow data, the Corps has not sufficiently analyzed the potential irrevocable commitment of White River resources.

Response 13. All current available data and information has been reviewed and utilized if it was determined it would impact any prior analyses or assessments. All reasonable alternatives have been addressed. Conservation measures which included increasing irrigation efficiencies, on-farm storage, and water management were optimized to the maximum extent practical. The Corps and NRCS have addressed the increased use of reservoirs instead of diverting from the White River. Current analyses indicate that

construction of additional storage reservoirs will not significantly increase the supply of irrigation water under either with- or without-project conditions. The area's farmers are already catching and storing all of the area's surface water that can practically be gotten. In order for more storage reservoirs to be effective, an alternate source to fill them must be provided. Even with an alternate source, additional reservoirs over the levels currently recommended have not been found to be economically justified.

As for additional current information, the Corps has used the latest documented information available at this time. If more recent information can be provided, which is contrary to the data currently used in the analysis, we will gladly consider its effects. Until such time, there is no basis for a change in the report.

Comment 14. If the Draft Report is adopted, the Corps must be very direct and explicit in its analysis of how cutoff levels tied to the ASWP will be required, monitored and not subject to change. Sample language is included under Comment 9. Also, the Corps' maintenance intentions should be clearly addressed.

Response 14. Language will be included in the PCA to ensure the pump cutoff levels. The cutoffs analyzed for the GRR and DEIS will be included in the operations manual referenced in the PCA. The operation and maintenance of the Grand Prairie Project is the responsibility of the non-Federal sponsor. The Corps has the authority to insure that the project is being operated and maintained according to the operations manual. A monitoring plan will be developed in conjunction with resource agencies to ensure that the operational restraints are followed and verify project impacts. The Grand Prairie project will have no effect on the Corps' maintenance of the White River.

Comment 15. Finally, Bunge is in the process of considering retaining one or more independent experts of national stature to review the navigation flow issues. This is being done so that effects relative to the White River and navigation can be thoroughly analyzed, including hydrology, groundwater and surface water. By filing these comments, Bunge reiterates its extension request made in its September 16th letter, copy attached as Exhibit A. Bunge anticipates the Corps will give due consideration to any such information.

Response 15. Due to the critical need for the project, the comment period will not be extended. However, any additional information received will be given due consideration in further development and design of the project and operations manual. We will gladly consider additional pertinent studies or data developed or provided by independent experts.

VIII. United States Environmental Protection Agency
Region 6
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GENERAL COMMENTS

The Draft General Reevaluation Report and DEIS provides a general description of the proposed Grand Prairie Area Demonstration Project for Eastern Arkansas. Although detailed economic analysis is provided, a corresponding in-depth environmental analysis of project effects is not contained within the document. The DEIS need strengthening in the following areas (see detailed comments in the following section):

Comment 1. The format of the document is confusing. The DEIS does not provide a substantive analysis of alternatives other than the preferred (TSP) alternative. Differences between the alternatives have not been adequately assessed. In particular, the varying effects of the alternative levels of White River withdrawals should be addressed.

Response 1. The format of this DEIS was developed based on guidance contained in 40 CFR, sections 1502.10 through 1502.18; Engineering Regulation (ER) 200-2-2; and ER 1105-2-100, Appendix F. Four alternative plans were examined in detail. The distribution systems (canal and pipeline systems) and the on-farm components (e.g., reservoirs, tail-water recovery systems) are the same for each of these alternatives. However, the import systems vary with each alternative. Direct construction impacts are the same for each alternative, and hydrologic changes to the Whiter River are similar. In cases where alternative plan differences in hydrologic effects on environmental resources were considered insignificant, only impacts associated with the tentative selected plan were analyzed; these decisions were made by an inter-agency team.

Comment 2. The specifics of the proposed activities (details on pumps, pipelines, canals and associated structures) have not been addressed in the DEIS. The specific environmental effects of the project's construction and implementation should be fully assessed in the FEIS.

A number of resource areas are either not evaluated at all in the DEIS or are only briefly described, including Geology and Soils, Transportation, Land Use, Noise, Visual and Aesthetic, and Utilities. The FEIS should provide explanation for those resources that were not addressed in the document.

Response 2. The construction impacts associated with various project structures were totaled in the DEIS. To the extent practical, project impacts associated with the various structures have been broken out and presented in greater specificity in the FEIS. Some of the resource areas mentioned were not described in detail because they were not identified as significant. A "Construction" section has been added to the FEIS that addresses resource

areas such as transportation and utilities.

Comment 3. In general, impacts to water quality and aquatic resources need to be more detailed. For example, turbidity impacts to the White River and tributary streams should be fully analyzed as a function of the proposed water distribution system's throughput.

Response 3. The throughput impact to water quality on the White River should reflect past conditions. The water quality is governed by current irrigation practices and the project should not have any adverse impact on this situation. The irrigation efficiencies should decrease the amount of agricultural runoff. A monitoring program will be developed to ensure that any changes in water quality can be measured.

SPECIFIC COMMENTS

Comment 4. Clean Air Act. "Coordination of the DEIS will bring project into full compliance" (p. DEIS-6, Table 1-1). The DEIS does not specifically indicate whether a general conformity analysis is required. Please clarify in the FEIS.

Response 4. The project area is in attainment with air quality standards; therefore, a general conformity analysis is not applicable. This has been clarified in the FEIS.

Comment 5. Clean Water Act Section 402(p). The DEIS does not address whether NPDES permits are expected to be necessary for the proposed activities. Non-point agricultural runoff is not addressed in the document.

Response 5. It is anticipated that NPDES permits will be required for the project. This issue will be coordinated with the Arkansas Department of Pollution Control and Ecology, and NPDES permits will be sought as appropriate. Non-point agricultural run-off entering streams will not increase over existing conditions and may be reduced because of recovery efforts. This issue has been addressed in the FEIS.

Comment 6. Safe Drinking Water Act (SDWA). The DEIS does not indicate that the SDWA is applicable in regards to the White River and the proposed action. Please clarify in the FEIS.

Response 6. A purpose of this project is to protect and conserve ground water resources. Pumping of the alluvial aquifer and the Sparta aquifer, which supplies drinking water, for agricultural use would be reduced. The project would not adversely impact drinking water sources.

Comment 7. Endangered Species Act, Section 7. The DEIS makes no mention of any state-listed threatened or endangered species. Please address in FEIS.

Response 7. State-listed species have been addressed in FEIS.

Comment 8. The National Historic Preservation Act, Section 106. Surveys conducted for the GRR and DEIS identified 162 historic and pre-historic structures. (P. DEIS-58, Section 5.79). No specific Section 106 consultations are apparent. Please address the cultural resource issue and coordination requirements with the State Historic Preservation Officer in the FEIS.

Response 8. Cultural resources coordination has been addressed in the FEIS.

Comment 9. Native American Tribal Government Consultations. Copies of the GRR/DEIS were provided to representatives of two tribal governments. If there are any issues, please address in the FEIS.

Response 9. There has been no response from either of the Native American groups that were provided the report. Thus, it is assumed that there are no issues.

Comment 10. Environmental Justice Analysis. Over the past two decades, there has been increasing concern over environmental impacts in minority and low-income populations. To address these concerns, President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low -Income Populations" (hereafter, EO) on February 11, 1994.

NEPA mandates that Federal agencies fully consider environmental factors when proposing activities, programs, and policies which have the potential to significantly affect the human environment. Although social and economic impacts have always been a consideration in NEPA review, the Executive Order highlights the necessity to better integrate the consideration of human health, social, and economic effects into the NEPA process. The EO calls for collection and analysis of information on race, national origin, income level and other appropriate information for areas surrounding projects that have expected environmental, health and economic effect on those populations. We have enclosed a copy of the EPA Final guidance on NEPA implementation of the EO and to assist you in your analysis. Please document your EJ analysis in the FEIS.

Response 10. This executive order is addressed in the FEIS.

Comment 11. Analysis of Alternatives. The DEIS analyzes the TSP to a much greater extent than the other alternatives and often states that impacts associated with all of the alternatives are identical. The DEIS does not evaluate the impacts associated with increasing the amount of withdrawn water under each alternative (i.e., an 8.64% increase in the amount of water between 1480 CFS and 1620 CFS, and a 14.7% increase between 1620 CFS and 1900 CFS). An alternative-specific analysis of water withdrawals from the White River should be included in the FEIS.

Response 11. Direct construction impacts associated with all four alternatives are identical. Hydrologic effects on the White River do vary slightly by alternative. The impacts of these hydrologic changes on oxbow lake connectivity and on larval and littoral fishes of the White River were evaluated by alternative. However, it was decided by an inter-agency team that the effects of hydrologic changes on White River floodplain wetlands would be evaluated for the tentative selected plan (Alternative 7B) only. This decision was made after a careful examination of the data indicated that impact differences among alternatives would be insignificant.

Comment 12. DEIS Contents. Neither the DEIS nor Appendix C (Environmental) contain a list of abbreviations and acronyms. Such a list would help the general public and other reviewers by improving the readability of the document. Please include in the FEIS.

Response 12. Concur. An acronym/abbreviation list has been added to the FEIS.

Comment 13. DEIS Citations. Citation of appendices was not done consistently throughout the DEIS. Appendices to the GRR should be specific in the FEIS where relevant.

Response 13. Some additional references to appendices have been made in the FEIS.

Comment 14. Land Use. The DEIS does not adequately discuss the patchwork of private and public lands in the project area that would be impacted by the TSP. The FEIS should address how jurisdictional or boundary issues will be addressed in the TSP, including specifics on easements, purchases, or other plans for ensuring that privately held lands will be available for the project.

Response 14. Descriptions of and project impacts to public lands are presented in the STATE AND FEDERAL HOLDINGS sections of the DEIS. Privately owned farmland is addressed in the AGRICULTURAL LANDS sections of the DEIS. Additional real estate information concerning easements, purchases, etc., has been added to the FEIS.

Comment 15. Mitigation. The DEIS does not provide specific time periods and deadlines for the implementation of mitigation measures, relative to project implementation. Please incorporate mitigation timeliness in the FEIS.

Response 15. A mitigation schedule has been incorporated into the FEIS. Mitigation will be concurrent with project implementation.

Comment 16. DEIS Format. The format of the DEIS is confusing and it may be difficult for the public to determine exactly what actions are being proposed, and the probable environmental impacts of these actions. At a minimum, the FEIS should provide a schedule of the various plans, clearly identify active alternatives for the purposes of NEPA analysis, and maintain consistent terminology throughout the document. For example, area maps in

Appendix C, Section VII: Habitat (Wetland) Maps should be referenced where appropriate and other findings presented in the appendices should be referenced consistently.

Response 16. See response 1 regarding DEIS format. A construction schedule is contained in Volume 1, Main Report. The plan alternatives were clearly identified and evaluated and consistent terminology was used throughout the DEIS. Relevant references to appendices have been added to the FEIS.

Comment 17. White River Dredging. The FEIS should address the proposed action's potential for increased dredging requirements of the White River necessitated by the anticipated water withdrawals.

Response 17. The project will not alter the authorized level of maintenance on the White River. That authorized level is based on the ability to navigate prescribed barge drafts at river flows at a prescribed gage reading. The water withdrawals will therefore not alter the maintenance requirements on the White River.

Comment 18. Projected Water Demands. The FEIS should address whether withdrawals from tributary streams for agricultural purposes are expected to increase in the future to address the projected shortfall in water resources anticipated under 7B (59,791 acre-feet/yr at 2015 and beyond); and whether these withdrawals will exceed the benefits of supplemental water that would be provided under the proposed project.

Response 18. The 59,791 acre-foot figure is a true shortfall that will go unmet. It cannot be removed from tributary streams. At this point, the users will be withdrawing all that is practical to withdraw. Project benefits and impacts were analyzed based on water withdrawals over the 50-year project life. Pumping will be halted at minimum pool elevations during times of water shortfall in order to protect aquatic resources and ensure efficient operation of the irrigation system. These issues have been clarified in the FEIS.

Comment 19. Flow Evaluation. The FEIS should address the Game & Fish Commission letter requesting the Corps complete a comprehensive in-stream flow evaluation on the White River near DeVall's Bluff.

Response 19. Following the Arkansas Game and Fish Commission (AGFC) letter, the U.S. Army Waterways Experiment Station (WES) was contracted by the Memphis District to conduct a study to identify and evaluate potential project effects on the area fisheries. This study plan was coordinated with and accepted by AGFC and U.S. Fish and Wildlife Service representatives. In lieu of an in-stream flow evaluation, WES examined potential effects on oxbow lake connectivity, employed the Habitat Evaluation Procedure, and conducted a larval fish study to analyze project impacts to the White River fishery. The complete study findings are contained in Volume 9, Appendix C, Section V; a study summary is presented in the FEIS.

Comment 20. Impacts on Tributary Streams. The DEIS states that “supplemental water will be provided to the tributary streams...” but does not specifically state what quantities would be transferred to specific tributaries under the proposed action. These quantities are crucial to determining impacts to individual tributaries.

Response 20. Impacts to tributaries from additional water from the canal system were analyzed. The magnitude of flows that were delivered to the tributaries were determined to a small percentage of the 1.01 year flood (10 %) as shown in the H and H appendix page III-28. This resulted in very small changes to remaining frequency flowlines in which the percentages were smaller.

Comment 21. Groundwater. The DEIS states that the TSP would “preserve the alluvial aquifer” but gives insufficient data to support this conclusion. For accuracy, the FEIS should state that implementation of the TSP alone will not “preserve the alluvial aquifer” since limits on withdrawals from the aquifer is a state decision. In addition, issues related to agricultural interests that elect not to participate in the program should be addressed.

Response 21. If users in the area continue to mine the aquifer, the aquifer will not be preserved. Even in the absence of regulation, participation in the project will extend the life of the aquifer and allow for recharge during years when sufficient import water is available to replace groundwater demands. This should allow for limited recharge and be sufficient to prevent permanent loss of the aquifer. In the long run all interests who do not have sufficient existing sources of surface water to meet all of their needs will be forced to participate in the project for purely economic reasons. There is also expected to be an economic incentive to use import water over groundwater since the sponsor's cost of providing water to the farmer is expected to be less costly than both shallow and deep aquifers.

Comment 22. Water Quality. The FEIS should address the water quality impacts on the White River of the construction of the pump station and inlet channel proposed for water withdrawals. Specifically, the analysis should address increased turbidity and impacts on downstream fisheries as a result of the construction and potential maintenance dredging required by the project.

Response 22. Construction practices to minimize impacts to water quality will be incorporated. Monitoring of water quality downstream of the inlet will be conducted during construction in order to address possible changes. Dredging activities occur annually on the White River and although there is a slight increase in turbidity, the effects are short lived and have not posed a problem to the fishery. These issues have been addressed in the FEIS.

Comment 23. Irrigation System Dewatering. The FEIS should address the frequency in which the proposed irrigation system is expected to be dewatered, and the potential impacts on tributary streams of these events.

Response 23. The irrigation system includes features that will require various levels of maintenance. Pumping units, gates, and other mechanical and electrical components will require maintenance at prescribed intervals based on manufacturers' recommendations. These prescribed intervals will insure proper operation and life of the components. Maintenance will include structure upkeep and replacement, pumping plant upkeep and replacement, canal cleanout, and bank stabilization.

Dewatering of individual/major components may be required to perform maintenance and inspection activities. Under normal conditions, these components will most likely be dewatered on average once every five years for inspection and routine maintenance. Also, activities will be scheduled during non-operational periods. Dewatering of the individual canal segments may be required but is not planned because routine canal maintenance can be performed under operational conditions. Dewatering of the entire irrigation system would not be feasible or practical once the system is operational. Engineering controls can be used to dewater individual components of the system on an as needed basis. Potential impacts to tributary streams will be minimal.

Comment 24. Cumulative Water Quality Impacts. The FEIS should address the cumulative impacts on White River water quality due to the planned realignment of Highway 70 in the vicinity of the proposed pumping station and the construction of a new bridge over the White River.

Response 24. The realignment of Highway 70 and construction of the new bridge are well underway. The construction of the inlet channel will have minimal water quality impacts, and construction practices to minimize impacts will be incorporated. A cumulative impacts section has been added to the FEIS.

Comment 25. Sediment Loading and Future Dredging. The DEIS does not address projected sediment loadings on tributary streams based on the different flow rates (ranging from 1480-1900 CFS) corresponding to the different alternatives and whether future dredging of tributary streams is projected to be necessary. Please address in the FEIS.

Response 25. Potential sediment deposition in tributary streams was addressed for the selected plan in the water quality section of the DEIS. Differences in sediment loadings among alternatives would be negligible. As stated in H and H Appendix, 5-B-03 Summary, the potential for deposition, as presented, represents worst-case conditions. Limited sediment data in the White River indicates suspended sediment concentrations of approximately 74 mg/l. Inlet channel deposition was predicted to remove virtually all of this material: therefore, water actually entering the canal system should be relatively sediment free. As such, deposition rates shown for concentrations of 40 mg/l and 60 mg/l would significantly overstate depositional tendencies. Actual deposition within the canal system should be minimal. Any scour potential should be limited by the cohesive nature of the canal banks (constructed to minimize seepage) and vegetative cover above the waterline.

Additionally, the canal system will function as a series of pools, between check structures, except when at peak capacity. Average canal velocities at peak capacity will be 1.6 feet per second or less. With a limited sediment load being transported within the canal system, the potential for significant sediment inflows into the natural streams would be very minimal.

Comment 26. Aquatic Resources. The DEIS does not fully address or analyze the concerns expressed by a state commission about the potential impact of weirs on the hydrology of riparian plan communities. Please address this issue in the FEIS.

Response 26. The concern over the heights of some weirs was raised in the Unresolved Issues section of the DEIS. The DEIS also stated that an inter-agency team would conduct investigations to determine if any sensitive plant communities would be adversely impacted and that, if necessary, weirs would be relocated or redesigned to avoid or minimize impacts to these plant communities. The inter-agency team will be conducting field investigations of proposed weir sites in the near future. The Memphis District is committed to working with the inter-agency team to avoid and/or minimize potentially adverse impacts associated with project weirs. Concerns about the weirs as well as our commitment to resolve these concerns have been restated in the FEIS, and a schedule for completing the weir investigations and final weir designs and placement locations has been added to the FEIS.

Comment 27. Zebra Mussel Impacts. The FEIS should address the potential impacts of the widespread introduction of zebra mussels into tributary streams as a result of the proposed project.

Response 27. Concerns over potential zebra mussel impacts to native mussels within tributary streams led the Memphis District to contract the U.S. Fish and Wildlife Service (USFWS) to perform a reconnaissance mussel survey of LaGrue Bayou. The USFWS concluded that native mussels are scarce due to channel modification, agricultural runoff, and water withdrawals. The USFWS also concluded that additional mussel surveys of tributary streams were not necessary; concerns regarding zebra mussel impacts to native mussels were alleviated. Also, if zebra mussels proliferate in the White River, their dispersal into the tributary streams is likely inevitable, even without project implementation. Moreover, maintaining year-round minimum surface water elevations within these streams will provide benefits to aquatic organisms. This information was provided in the DEIS; no additional evaluations are deemed necessary.

Comment 28. Timber. The figures for forest acreage within the project area are not consistent between the two references within the GRR. (P. 11: 42, 313; p. 20; 41, 957). Please clarify in the FEIS.

Response 28. These discrepancies have been corrected.

Comment 29. Bottomland Hardwood Forest Mitigation Allowances. Mitigation measures

include acquiring 243 acres to mitigate impacts to bottom land hardwoods. The 243 acres was calculated in the Habitat Evaluation System (HES) which included bottom land hardwoods, forested swamps, scrub/shrub, and marsh lands. The DEIS does not, however, stipulate how much of the 243 acres will be available specifically for bottomland hardwood revegetation. Please clarify in the FEIS.

Response 29. The entire 243 acres will be planted bottomland hardwoods. This was stated in the DEIS on pages EIS-65 and EIS-69.

Comment 30. Timber Section Distinction. The DEIS does not explain the relationship between the bottomland and upland hardwood sections and the timber section. In this case, the timber section is an overview and totaling of the impacts and mitigation of the previous sections and presents no new data. Please address in the FEIS.

Response 30. Concur. The TIMBER sections have been deleted in the FEIS.

Comment 31. Wetlands. The GRR and DEIS should be consistent in characterization of estimated wetlands losses due to the proposed activities. GRR p. 54 states that there would be a “loss of approximately 245 acres of wildlife habitat and 121 acres of wetlands.” GRR p.89 states that wetlands impacts are expected to be: “64 acres lost; 57 acres temporarily impacted”; consistent with p. DEIS-23. Appendix C. p. IV-4 states that “construction of the project would result in the loss of approximately 128 acres of wetlands. In addition, it is estimated that 57 acres of wetlands would be temporarily impacted.” Please clarify in the FEIS.

Response 31. Wetland acreage discrepancies have been corrected.

Comment 32. Endangered and Threatened Species. The DEIS should address possible impacts to the Federally listed endangered species Interior Least Tern, as indicated in the USFWS correspondence of May 8, 1998. Consultation on this matter should be incorporated in the FEIS.

Response 32. In the draft Fish and Wildlife Coordination Act (FWCA) report, the USFWS stated that the interior least tern occurred along the lower White River and that it was the responsibility of the Memphis District to determine potential project impacts to this endangered species. Following review of the draft FWCA report, the USFWS was informed that it was the opinion of Memphis District biologists that the interior least tern did not inhabit the study area portion of the White River. The USFWS agreed with this opinion and instructed the Memphis District to disregard the earlier recommendation to assess impacts to the tern. However, the USFWS inadvertently left the statement regarding the assessment recommendation in the final FWCA report.

Comment 33. Bald Eagle Nests. The DEIS states that “no significant tree loss would occur

near the White River” but does not address whether the area proposed for clearing coincides with any temporary bald eagle nest locations. Please address in the FEIS.

Response 33. This issue has been addressed in the FEIS. At the time of the DEIS, no eagle nests were known to exist in the study area. Since that time, the Arkansas Natural Heritage Commission has informed the Corps that an eagle nest was discovered in a portion of the study area that will not be impacted by the project. The discovery of this nest has been documented in the FEIS.

Comment 34. Recreation. The DEIS states that the flooding of additional acreage of harvested rice fields would generate additional waterfowl hunter-days and related expenditures (pp. DEIS-75 to DEIS-76, Section 6.73). These figures assume public access to these lands, which is not consistent with the statement that the USFWS “have noted that the general public would not have access to hunt waterfowl on these lands.” (P. DEIS-4, Section 1.13). Please clarify in the FEIS.

Response 34. Man-day hunting estimates did not assume access to the general public.

Comment 35. Agricultural Lands. The FEIS should address the erosional impacts of the proposed action, specifically on tributary streams due to the additional water from the White River that “would provide minimum summer water levels that are substantially higher than existing summer levels.”

Response 35. As stated above in Responses No. 20 and 25, quantities for water and sediment discharge rates were considered to be insignificant. Minimum summer water levels that are substantially higher than existing summer levels would not increase erosion rates since the corresponding water levels would still remain in the range of stream flow events presently experienced. As state earlier, the additional water in the tributaries was found to be insignificant.

Comment 36. Navigation. This resources area is not adequately evaluated in the DEIS. The increased movement of commodities, which are projected to rise 98 percent by the year 2056 (pages DEIS-57), and the increased need for capacity are not evaluated in relation to the TSP. Please address in the FEIS.

Response 36. This area is adequately addressed. The projected increase in tonnage is expected to occur without the project. This is not a project induced occurrence. Since it is not a project related impact there is no need to evaluate the effects of the increased movements or increase in capacity on the area's economy or environment.

Comment 37. Cultural Resources. The GRR and DEIS are inconsistent in numbers of sites identified through the cultural resources survey. Please clarify in the FEIS.

Response 37. The discrepancy in the number of sites has been corrected.

Comment 38. Air Quality Analysis. The DEIS states conclusions regarding air quality impacts without providing analytical or modeling support for them. In particular, construction impacts on air quality for the lifespan of the construction project should be fully addressed.

Response 38. Emissions from mobile sources would be de minimis. The project area is in attainment with all standards, and the project would not jeopardize attainment status or the state implementation plan. These air quality issues have been clarified in the FEIS.

Comment 39. Cumulative Impacts. The FEIS should identify other current and proposed withdrawals from the White River and provide analysis of the cumulative impacts of these withdrawals on flow rates, particularly during annual low flow periods and drought periods. For example, the proposed action is only one of five proposed projects in the area, including tow that would withdraw water from the White River. The FEIS should evaluate riverside-wide cumulative impacts, particularly under drought conditions.

Response 39. Concur. A section has been added to the FEIS that addresses cumulative impacts to the White River.

Comment 40. Construction. The GRR states that, "A plan will be developed which identifies procedures to avoid and/or minimize adverse construction impacts". Such impacts should be identified and analyzed in the FEIS, and potential mitigation identified in order for the public and reviewing agencies to have complete information on the impacts of the proposed activities. Issues that should be analyzed include duration of specific construction projects, numbers and source of workers, socioeconomic impacts of construction, transportation, impacts on local businesses, air quality, and soils and erosion.

Response 40. Impacts to Section 122 items such as socio-economic conditions and local businesses and farms were addressed in the main report and DEIS. Air quality issues have been restated for greater clarity. Also, a construction section has been added to the FEIS to address topics such as construction impacts to transportation and utilities, the construction schedule, and preventative measures to reduce soil erosion.

IX. Sierra Club
P.O. Box 2246
Little Rock, Arkansas 72221

Comment 1. First of all, it seems that the economic analysis, which ultimately must be the justification for this project, is flawed. It appears that the only economic costs considered are those related to the money outlays associated with construction and maintenance of the

irrigation project and associated conservation efforts. Stated differently, no economic value is placed on the water to be relocated by this irrigation project. An assumption that the water to be transported has no economic value in its original location would seem to be unjustified, economically speaking, especially as navigation interest are already seeking a dredging project to deepen the channel of the White river over much of its length. A valid economic approach would seek to determine the increase in value if any of the water imparted by it relocation and compare that increase to the cost of performing the relocation.

Response 1. The true economic value of any resource is its use. The existing economic use of the water in the White River is navigation. Therefore, the economic cost of the diverted water is any additional cost incurred by the navigation industry. A detailed economic analysis of these impacts has been completed and is presented in the Draft Report on pages D-II-35 through D-II-49.

Comment 2. Analysis of indirect economic cost and benefits are similarly flawed. While the report notes the loss of some valuable wildlife habitat, this appears to relate only to discrete locations that will be destroyed in construction of the pipeline and not to the diffuse impacts that might result in the area from which the water is being extracted. It is difficult to believe that extraction of substantial waters from the White River will not impact wildlife habitat in the basin at large. If so your study does not appear to account for this loss. In short, it appears that your study simply assumes no economic value (direct or indirect) for the water in its current location and this is simply not a reasonable assumption.

Response 2. The direct impacts of the project (both positive and negative) are included in the project's benefit to cost ratio. Their derivation is presented in the Environmental Appendix of the Draft Report.

Comment 3. On the flip side , the direct economic benefits appear to be based on the market value of the crop (rice) presumed to be produceable. This again appears to be an oversimplification and an invalid economic approach. The choice here is not likely between the production of rice and the production of nothing. Without the irrigation project, there are doubtless other crops that could be grown on a sustainable basis. It is only the difference that should be claimed as a benefit. Likewise, the study seems to assume that additional flooded acreage in the irrigated area is beneficial to wildlife (water fowl) without the fact establishing that there is currently a shortage of flooded fields during the relevant seasons.

Response 3. The agricultural benefits of the project are not measured as the production of rice versus the production of nothing. They are measured as the net value to the nation's economy of irrigated crop production versus dryland crop production. The number of acres of each crop expected to be grown under without-project conditions is presented in Table D-II-3. The number of acres of each crop expected to be grown under with-project conditions is presented in Table D-II-9. You will notice that both conditions include significant acreage

of dryland crops. Neither condition contains any acreage of abandoned farmland. Future conditions do however contain a small acreage of abandoned fish ponds.

The *Lower Mississippi Valley Joint Venture Evaluation Plan*, a U.S. Fish and Wildlife Service (USFWS) publication, identifies the flooding of additional cropland as critical in meeting habitat requirements of waterfowl within the Lower Mississippi; and *Habitat Arkansas 2000: Arkansas Implementation Plan for the Lower Mississippi Valley Joint Venture of the North American Waterfowl Management Plan* recognizes the importance of flooding additional cropland for waterfowl in Arkansas. Also, coordination with waterfowl biologists from the U.S. Fish and Wildlife Service, Arkansas Game and Fish Commission, National Biological Service, and Ducks Unlimited revealed that the flooding of additional cropland would be beneficial to waterfowl within the project area. These waterfowl biologists informed the Memphis District that, in order for the project to provide its proportional share of waterfowl habitat for the North American Waterfowl Plan, approximately 45,000 acres of harvested rice fields would have to be flooded annually and another 30,000 acres of harvested rice fields would have to be managed in case of sufficient rainfall for flooding. The project can only provide 38,529 acres of cropland flooding on an average annual basis due to withdrawal limitations on the White River.

Comment 4. Finally on the economic front, crop prices and capital costs have been determined by utilizing snapshot data prevailing at a specific point in time, rather than a relevant historical average. This appears to be of particular importance since the cost benefit ratios generated in your study, even with the above flaws, appear to be marginal.

Response 4. The crop prices and the capital costs are not snapshot data. The crop prices are "Current Normalized Prices" which are developed by the Water Resources Council and are reflective of long term market trends. The capital costs are calculated using interest rates that are developed in accordance with Section 80 of Public Law 93-251 for use in the evaluation of National economic effects of water and related land resources plans. They are reflective of the Federal government's long term cost of borrowing. As for the availability of water for diversion, a 47 year period of record model was developed to estimate the availability of water throughout the irrigation season. This model was used to match the availability of water to the seasonal demand for the entire 47 year period of record. The results indicated that on average 87.6 percent of the project area could be fully irrigated. The results of the reliability analysis are presented on pages D-II-23 through D-II-26.

Comment 5. These flaws aside, the Chapter's greatest concern is the potential for widespread adverse environmental impacts. The Chapter is concerned that the environmental analysis in this instance is being performed in isolation and does not consider other planned activities, including other irrigation projects, and a proposal to dredge the White River. A study which does not include all relevant factors is fundamentally flawed and provides an inadequate basis for rational decision-making. Likewise, a failure to

consider widespread diffuse impacts and future demands on these water resources flaws the reports environmental analysis.

Response 5. A section has been added to the FEIS that assesses cumulative impacts of other potential irrigation projects on the White River. The hydraulic impacts associated with the Montgomery Point Lock and Dam were examined in association with this project, and it was determined that the hydraulic effects of the two projects would not overlap. Also, post construction monitoring programs will be designed and implemented with input from appropriate natural resource agencies; actual effects on the White River fishery, floodplain wetlands, and water quality will be monitored. Furthermore, the White River Navigation to Newport, Arkansas, General Evaluation is quantitatively analyzing cumulative impacts associated with it and the GPADP.

Comment 6. Finally, we are not satisfied that the report demonstrates an adequate consideration of all conceivable alternative approaches to solving the aquifer depletion problem in the area of interest. Reforestation to enhance aquifer recharge is not discussed, nor more glaringly is resorting to alternative crops that are less water-intensive.

Response 6. Extensive formulation and evaluation of alternative measures to protect and preserve the aquifer were investigated. Conservation was maximized to the extent practical. Conversion to dryland farming was analyzed as part of each alternative. No combination of measures can provide a level of reliability to sustain the economic viability of the region without an import water component.

Comment 7. The Chapter recognizes the importance of agriculture to the State's delta region. However, in the long run, methods and practices must be developed that are sustainable. Many of the conservation and land impoundment methodologies addressed in your study, if adopted earlier, could have forestalled the aquifer-depletion crisis which this irrigation project is intended to address. These efforts and a reduction in rice acreage could solve it at no expense to the public or the environment.

Response 7. Aquifer depletion in the project area is a present crisis. New conservation practices and increased storage reservoirs cannot solve this crisis. Only a massive shift to dryland practices as reflected in the expected future without-project conditions presented in Table D-II-3 could prevent further aquifer depletion. However, this would be at a great expense to the national economy, not just the local economy. All estimated effects presented in the report and used in the project's benefit to cost ratio are national effects.

Comment 8. Aquifer depletion is a problem that extends beyond the area to be irrigated by this demonstration project. If sustainable practices are not to be encouraged as the solution of choice in this area how can we urge them as a solution in the next, and where will the water for that area come from and at what cost to the tax payer and the environment?

Response 8. The Grand Prairie Area Demonstration Project was analyzed over the project life. The project protects the aquifer as well as provides significant economic benefits to the national economy. The project prevents the loss of existing waterfowl feeding and resting habitat, provides additional waterfowl habitat, and provides prairie restoration and fisheries benefits. Any additional Corps projects would have to undergo the same rigorous studies and analyses to demonstrate Federal interest before construction.

Comment 9. In the Chapter's view it is highly unlikely that a public subsidy, in the form of transplanting water from one area of the State to another, in order to support unsustainable agricultural practices, can be justified economically, and removing water from the White river basin and putting it on rice fields will almost certainly represent a net loss from an environmental and wildlife habitat standpoint.

Response 9. The comment implies that irrigation water will be transported long distances within the state. In fact, the project will withdraw irrigation water from the White River at DeValls Bluff, Arkansas, which is immediately adjacent to the project area. The comment also states that the area's agricultural practices are unsustainable. This statement conflicts with the area's rich agricultural history. For example, the area's rice industry has long been the foundation of its economy. Agriculture has weathered many times of economic hardship and enjoyed numerous times of prosperity. Agriculture in the area will evolve to meet new challenges just as it has in the past, and continue to be a viable contributor to the area's economic well-being. Irrigation will also continue to be a key component of its agricultural economy. The only question is at what level, greatly reduced under future without-project conditions or maintained under future with-project conditions. Further, the comment states that the project cannot be economically justified. This is clearly not true. The economic justification of the selected plan is presented in Volume 10, Appendix D, Section II, of the General Reevaluation Report. The project's benefits and impacts were analyzed using appropriate scientific techniques and are fully presented in the GRR and EIS. The analyses showed minimal impacts and substantial gains in fish and wildlife habitat in the project area.

X. NATIONAL WILDLIFE FEDERATION
GULF STATES NATURAL RESOURCE CENTER
4505 Spicewood Springs Road, Suite 300
Austin, Texas 78759

The letter received stated that the EIS failed to address comments 1 thru 5 listed below:

Comment 1. Ecological and water quality impacts of converting existing and natural drainages and wetlands to conduits and reservoirs for the project.

Response 1. Even though we are using natural streams to convey irrigation flows, the introduction of the irrigation flows should benefit the region as stated in the water quality

portion of the GRR. Some of the streambeds are dry at times and the irrigation flows, along with the weirs, will provide year-round pools of water that will benefit fish. A detailed study which addresses potential project impacts and benefits to project area fisheries is presented in Volume 9, Appendix C, Section V; results of this study are summarized in the DEIS.

Comment 2. Effects on the White River National Wildlife Refuge of toxic metals, nutrients, pesticides and other contaminants that may be carried by irrigation waters into the system and subsequently into the Refuge.

Response 2. Existing water quality should not be affected by the project. The water quality of the area is governed by current water management practices and the project should not have any adverse impacts.

Comment 3. Impacts of water withdrawals from the River on minimum stream flows necessary to support fishery resources.

Response 3. The fishery study conducted by the U.S. Army Waterways Experiment Station (Volume 9, Appendix C, Section V) adequately evaluates potential project impacts and benefits to area fisheries. Project-induced changes to the White River are not sufficient to impact minimum flow requirements of fish. Pumping would cease once river stages reach minimum flow requirements identified in the 1986 Arkansas State Water Plan. Changes in water levels during pumping would be less than a foot and would not effect habitat requirements of fishes during the low flow season.

Comment 4. Effects on the LaGrue bayou mussel beds.

Response 4. The U.S. Fish and Wildlife Service (USFWS) and the Arkansas Game and Fish Commission raised concerns during the general reevaluation about potential project impacts (i.e., temperature changes induced by import water, zebra mussel introductions) to mussels within the tributary streams of the project area. The Memphis District funded a reconnaissance mussel survey of LaGrue Bayou; this survey was performed by the USFWS. The USFWS found only low-density mussel populations. They attributed the relative scarcity of mussels to channel modification, agricultural runoff, and irrigation withdrawals. The USFWS informed the Memphis District that more intensive surveys were not needed.

Comment 5. Lack of specific and enforceable mitigation and conservation measures (the project relies heavily on voluntary measures).

Response 5. Four hundred thirty-six acres of cleared land will be purchased and reforested in order to mitigate impacts to wildlife habitat. The mitigation plan is discussed in the DEIS and in Volume 9, Appendix C, Section II. The waterfowl component is not necessary for mitigation but is a conservation features of the project. Although the waterfowl feature (i.e., flooding of over 38,000 acres of harvested rice fields on an average annual basis) would be

implemented on privately owned farmland, it will be an important component of the project and an integral part of the operation and maintenance plan. Under the Project Cooperation Agreement, the local sponsor would be required contractually to implement the waterfowl feature.

Comment 6. While the Grand Prairie project alone raises serious environmental issues, these cannot be properly evaluated independently of the other irrigation and navigation projects under consideration. The potential cumulative impact of these projects is substantial and could affect wildlife habitat and natural communities throughout eastern Arkansas. NWF is specifically concerned that taken together these projects will destroy diverse wetlands throughout the region, harm fish and wildlife populations, cause shifts in vegetative communities, reduce water quality, and threaten the health of the White River National Wildlife Refuge.

Response 6. A section has been added to the FEIS that addresses cumulative impacts of other potential irrigation projects (i.e., Little Red River, Black River) on the White River basin. Environmental monitoring programs for the GPADP will be designed and implemented with input from appropriate natural resource agencies to insure predicted results match the actual impacts.. Any future study would analyze impacts considering existing or authorized projects in place. However, at this time, the only planned, funded, or authorized project utilizing the White River or its tributaries excess water is the Grand Prairie Project. Also, the White River Navigation to Newport, Arkansas, General Reevaluation is quantitatively evaluating cumulative impacts associated with it and the GPADP.

Comment 7. The National Environmental Policy Act and regulations adopted by the council on Environmental Quality recognize the federal government's duty to consider cumulative impacts of proposed actions. The Grand Prairie Area Demonstration Project, the other irrigation projects contemplated in the Eastern Arkansas Study, and the proposed navigation project will cause cumulative impacts as defined by the CEQ regulations. A cumulative environmental impact analysis therefore must be conducted for the affected region which fully evaluates the ecological, hydrological, water quality and the other impacts of all proposed projects, which demonstrates how impacts to wetlands will be avoided, and identifies specifically how mitigation will be ensured for all unavoidable wetlands losses. This cumulative EIS must be completed and reviewed before final approval of any of the study projects.

Response 7. See Response 6.

XI. United States Department of the Interior
Fish and Wildlife Service
1500 Museum Road, Suite 105
Conway, Arkansas 72032

GENERAL COMMENTS

Comment 1. The GPADP offers a partial solution to the escalating problem of pumping from the area's aquifer. If carefully planned and executed the project would have limited impacts on the area's resources and help slow the depletion of the aquifer. In addition, certain design features would create a net gain in benefits to ducks and shorebirds as well as increasing the prairie remnant areas. Some of the stated goals of the GPADP include:

1. The annual flooding of 38,529 acres of harvested rice fields for ducks. Providing an additional 12,275,949 duck-use-days per year.
2. An increase in on-farm storage and other water conservation methods. According to the draft GRR and EIS, an additional 8,849 acres of cropland would be converted to on-farm storage reservoirs, providing 88,493 acre-feet of storage capacity. In addition, there would be an increase in the number of tailwater recovery systems.
3. Reduction in the amount of water pumped from the aquifer for agricultural use.
4. Re-establishment of native prairie vegetation within the rights-of-way of new irrigation channels.

Throughout the draft GRR and EIS these goals are repeated and data is presented showing how the project would reduce the amount of water pumped from the aquifer for irrigation. However, we are concerned about the implementation of some project features since several of the key components of the project are based on voluntary participation. One of these components is on-farm water management, which is necessary for the GPADP to be successful. Yet the draft GRR states that the building and management of tailwater recovery systems, reservoirs, and/or reduced aquifer pumping is voluntary. Some form of water conservation should be made a mandatory part of the project requirement for participants. It is also important to note that tailwater recoveries and reservoirs, built as part of the GPADP, would not be required to be located on agricultural land. This raises concerns for additional wetland impacts. Flooding cropland to provide waterfowl feeding and resting areas is another part of the project which would be done on a voluntary basis.

Response 1. The PCA will include provisions to insure that the on-farm features, especially the additional on-farm storage reservoirs, are constructed. The operation plan for the project will also include the seasonal flooding for waterfowl. The sponsor will be contractually bound to operate and maintain the project according to the operations plan

before construction is initiated. The sponsor must ensure that the goals for the increases in efficiency, increased storage, and waterfowl flooding are reached over the project area.

Comment 2. Other points of concern are recreation, mitigation, and water quality issues. Though the Service and the Corps of Engineers (Corps) are within nine acres on our mitigation estimates, there is a important difference of opinion on the amount, duration, and type of management needed for the project's mitigation.

Response 2. See Response 8.

Comment 3. A water quality survey was included in the draft GRR and EIS. However, the Service still has concerns over water quality issues that could occur during the life of the project. We recommend that a contaminants monitoring program be made part of the GPADP.

Response 3. Concur. It is stated in the GRR that a water quality monitoring program will be implemented. The water quality program will be designed with input from appropriate agencies.

SPECIFIC COMMENTS

Comment 4. GRR, Main Report, pg. 68. In the on-farm storage discussion section of this page several assumptions are stated. "The new reservoirs are assumed to be located on lands identified for soybean production and are equally distributed throughout the project area." and that "an additional 8,849 acres of cropland will be converted to on-farm storage reservoirs." Yet in the GRR, NRCS On-farm Report (appendix A, pg. 59), it clearly states that participation in the on-farm program will be voluntary. The landowner would make the final decision on what conservation practices he would (or would not) practice or install. In addition, the land owner would have the final decision on the operation of any on-farm irrigation system. The Service believes for the project to be successful that water conservation measures such as tailwater recovery systems, reservoirs, and/or reduced aquifer pumping must be made a mandatory part of the project for all participants.

Response 4. Conservation measures are the most cost effective component of the project and are necessary to protect and preserve the aquifer. A sensitivity analyses was conducted that found the project is economically feasible in the absence of the on-farm features but does not maximize net positive benefits to the national economy. These features are not voluntary for the project area. They will be included in the PCA agreement between the Federal Government and the project sponsor.

Comment 5. EIS 4 Paragraph 1.13. The project as designed would not provide recreational opportunities to the general public. There are project features to flood cropland for waterfowl on private lands, but the general public would have no access to these areas. Although the Corps has stated, "recreational development is a low budgetary priority under

the current Corps policy”, the Service still recommends that you actively pursue the possibility of purchasing and/or enhancing additional wildlife habitat for public use within the project area. Plans and designs of such areas should be developed in a cooperative effort with the Service, Corps, and Arkansas State Game and Fish Commission.

Response 5. Development of public access will be considered for mitigation lands and in conjunction with any fish and wildlife habitat restoration measures identified in the separate environmental study.

Comment 6. EIS 5 Paragraph 1.14. There are some concerns about the height and placement of some of the one hundred and twenty weirs that would be constructed in existing tributaries as part of this project. The elevation differences of a number of the weirs and top banks of their respective channels is sometimes as little as one foot. Poor design consideration and weir placement could cause the pooled water to adversely impact the riparian plant communities of these tributaries. It was recommended that additional investigations be conducted to determine which of the weirs need to be redesigned or moved in order to avoid adverse impacts to sensitive areas.

Response 6. Reference H and H Appendix page III-30; riprap weirs were sited in the following locations: (1) locations along the natural waterway that would provide service to tracts not serviced by a canal or by a major pipe system, (2) locations upstream of bridges, (3) intermediate locations providing the deepest pool to as many tracts as possible, and (4) locations where the pool from the next downstream weir ends, provided that location is not in the middle of a tract already supplied. In order to obtain maximum benefit from each weir, it was desirable to set weirs at the highest possible elevation. It was decided to set weir elevations by determining the highest elevation that can convey the existing bankfull discharge with no significant increase in flowline elevation. The top of the weir was set at a trial elevation of one foot below the top bank. The bankfull discharge was input into the stream for with and without the weir. If the difference in water surface elevation was essentially zero, the weir was left at this height. If the difference was considered unacceptable, the weir was lowered.

The information stated above is required to achieve hydraulic design criteria. To address “adverse impacts to sensitive areas”, the weirs in these areas will need to be examined on a site by site basis. Once the locations are identified, hydraulic design modifications will be made or weirs relocated to avoid or minimize impacts to sensitive riparian plant communities.

Comment 7. EIS 75 Paragraph 6.73. In this section, under recreation, the Corps states that “the flooding of 38,529 acres of harvested rice fields each winter would generate 28,769 waterfowl hunting man-days annually...” Yet, in the NRCS On-farm Report (pg 59), it states that “participation in the on-farm program will be voluntary.” The flooding of agricultural land for waterfowl feeding and resting areas should be made a mandatory part of the project,

with waterfowl rest areas identified and incorporated into the project design.

Response 7. The waterfowl feature is a major component of the project. This feature is contained in the project operation and maintenance plan, and the irrigation district is responsible for its implementation under the project cooperation agreement. The Memphis District and the local sponsor are committed to the flooding of over 38,000 acres of harvested rice fields on an average annual basis.

Comment 8. EIS 94 Paragraph 8.13. Though the Service and the Corps employed different methods to analyze the projects impacts to wildlife habitat, and to determine compensatory mitigation requirements, there were only nine acres difference between the mitigation estimates. However, the Corps has stated that their mitigation requirements were determined base on insurance of 66 percent seedling survival one year from planting and no forest management once this seedling survival objective was obtained, "...had it been assumed that intensive management practices would be implemented over the 50 year project life, the mitigation acreage estimate would have been less." We feel that there must be some assurance that the values projected for the project mitigation will be achieved. However, intensive management of the project mitigation areas would not necessarily be needed to achieve the goal. After the survival rate is established, the mitigation area could be placed in caretaker status with a minimal management required. Therefore, while there is no objection to the proposed seedling survival rate, we still maintain that management of mitigation lands should be at project expense over the 50 year life of the project. We recommended that all mitigation acreage should consist of prior converted croplands or farmed wetlands. The Corps commented that damage to upland forest should be mitigated for by the reforestation of upland acreage. We have no objection to this mitigation.

Response 8. The local sponsor is required to obtain all project lands (including mitigation lands), easements, and rights-of-way. Operation and maintenance of the mitigation lands is also a responsibility of the local sponsor. Compensatory mitigation, a total of 436 acres, was determined assuming no management other than the insurance of 66% seedling survival one year from planting.

Comment 9. EIS 95 Paragraph 8.14. We recommend that contaminant surveys be made before and after project completion. Though a water quality assessment was made for this report (GRR, Environmental, Section III) the study seemed to concentrate its conclusions on how the water from the White River would effect agriculture. In fact, the summary and recommendations of the report (pg 53) only allude to the possible impacts of the White Rivers water on farmland. To balance this, more data should be collected and a baseline established so it will be possible to monitor for any future increases in pesticides, fertilizers, heavy metals, and other contaminants that are found in association with agricultural runoff. The GPADP would, in all probability, increase the amount of agricultural run off into the White River. Therefore, we recommend a comprehensive testing and monitoring program for these contaminants be incorporated into the project and tailwater areas, such as LaGrue

Bayou, be monitored. This monitoring should be set up for the life of the project to protect resources that fall within the scope of the project area. In addition, to protect the unique wildlife area of White river national Wildlife refuge, one of the areas monitored should be Jacks Bay on LaGrue Bayou.

Response 9. A monitoring program will be developed. Your participation will be sought during development of the scope of the monitoring plan. The increased tailwater recovery and on-farm storage should reduce the amount of agricultural runoff to streams. Extensive studies were conducted of the existing reservoirs and their overall water quality was found to be good.

Comment 10. EIS 95 Paragraph 8.15. We recommend that irrigation canals and on-farm reservoirs be located away from wetlands and natural heritage sites. Incorporating design recommendations from other resource agencies, the Corp aligned the proposed canals and pipelines to minimize as much as possible impacts to forest, wetlands, and prairie remnants and in Vol. 1, On-Farm Storage pg. 44, the statement is made that, "All reservoirs would be placed on cropland." However, in a later section of the same volume (EIS 95, 8.15) the Corps states that "It is assumed that on-farm project features would be constructed on non-wetland agricultural lands." We feel that this assumption is unwarranted. In fact, it is far more likely that the land used to create reservoirs and tailwater recovery systems would be land that is considered unsuitable for farming, such as a wetland drains or sloughs. And though it is true that the farmer would be required to "apply for and obtain an individual Section 404 (b)(1) permit", wetland protection should be the responsibility of this project and not transferred to another program. Without a mandatory requirement for the on farm storage to be placed in non-wetland areas there would be significantly greater wetland impacts associated with the project.

Response 10. All environmental and economic analyses and impact analyses were conducted assuming on-farm storage would be placed on existing cropland acres. The Natural Resources Conservation Service currently estimates that approximately 200 acres of farmed wetlands would be lost to construction of on-farm features (i.e., reservoirs, tailwater recovery systems). Approximately 200 acres of farmed wetland or prior converted farmland will be acquired and planted in bottomland hardwoods to mitigate these impacts. It is important to note that these are only estimates of the on-farm impacts and subsequent compensatory mitigation. The actual impacts and required mitigation will be determined as each on-farm plan is completed. Mitigation will be acquired in manageable tracts for the on-farm wetland losses by the project sponsor. The mitigation will be acquired at the same rate as the on-farm features are constructed.

Comment 11. EIS 97. Paragraph 8.23. It was recommended that the cumulative impacts of all five irrigation projects proposed in the Eastern Arkansas Project (EAP) be addressed. The Corps offered that any future Corps projects involving the White River would address the cumulative impacts of that particular project and the GPADP. The reason given for this was

that only two of the five irrigation projects proposed in the EAP involved withdrawal from the White River, the GPADP and the White River Irrigation Project. The other three projects are located in different basins.

We feel strongly that the cumulative impacts of all projects involving the White River should be addressed in detail. The demands of navigation, agricultural irrigation, and regulated flow releases from the reservoirs all combine to place an inordinate amount of strain on the river's hydrologic features and the network of interrelated biological systems that rely on them. If not properly monitored and controlled, the demands for water from the river system could, at the very least, adversely impact its fisheries, riparian habitat, oxbows, bottomland hardwoods, and the wildlife which depend upon them. All these systems rely heavily on the river's seasonal flood regime. If the demands for water from the river are such that this pattern is disrupted there would be serious impacts to these natural systems.

This argument holds true for the other water systems that will be impacted by future EAP's. Therefore, we recommend that the impacts of future Corp projects in each of the basin areas and river systems be studied in-depth, along with the cumulative impacts of projects already in place, before the start of each project.

Response 11. Actually, potential irrigation projects for three other areas (White River, Black River, and Little Red River) identified in the Eastern Arkansas Region Comprehensive Study (EARCS) could affect the White River. A section has been added to the FEIS that assesses the cumulative impacts of these projects. If studies are authorized and funded for other projects, these studies would assess the impacts of all other authorized projects at that time. The White River Navigation to Newport, Arkansas, General Reevaluation, is quantitatively assessing cumulative impacts associated with it and the GPADP. A post-construction monitoring program will be implemented for the GPADP to continue to assess water quality and to assess impacts to White River flows and larval fishes.

XII. Arkansas Game & Fish Commission
2 Natural Resources Drive
Little Rock, Arkansas 72205

Comment 1. We would like to emphasize the fact that the pipeline right-of-way for this project is presently proposed to cross the Arkansas Game and Fish Commission Wattensaw Wildlife Management Area (WMA). This has been discussed in the initial stages of planning, at which time the pumping plant site and pipeline corridor were adjusted to minimize adverse impacts to wetlands and the Wattensaw Wildlife Management Area. The pipeline and right-of-way design as well as impacts, compensation and/or mitigation measures should be fully coordinated with our agency and addressed in specific detail.

Response 1. The plans and specifications for the pipeline are currently being prepared and

coordinated with your office along with proposed mitigation.

Comment 2. We have been participating in the general fish and wildlife restoration and enhancement features such as winter water for waterfowl, higher than normal annual water levels in the irrigation ditches and waterways for fisheries resources, etc. There is no mention, however, of our previous recommendation urging you and the irrigation district to pursue the possibility of purchasing and enhancing additional wildlife habitat as part of the project somewhere in the benefited area. This property should be set-aside for the primary purpose of wildlife management and public use. The same consideration should be given to fisheries resource features, also including public access to the resource. We feel this is an important project feature based on public funds utilized on a project of this magnitude. This and other potential fish and wildlife resource restoration and enhancement opportunities, as well as mechanisms that would guarantee features, such as winter water for waterfowl and other wildlife conservation measures based on irrigation water usage, should be put into place for the life of the project.

Response 2. Incorporation of public access with the mitigation features will be considered along with public fishing access to the canal segments located within land acquired for mitigation. The Arkansas Game and Fish Commission will be fully coordinated with on these features. Studies have been initiated to examine additional environmental features for the project.

Comment 3. There should be a more thorough assessment of the project affect on transportation vectors such as zebra mussels and other exotic species. The introduction of the zebra mussel into this extensive system of waterways by this project should be acknowledged and environmental impacts addressed.

Response 3. The introduction of zebra mussels into tributary streams is addressed on pages EIS-64 - EIS-65. Regarding zebra mussels, the major concern raised by natural resource agencies was the potential adverse impact to native mussels in tributary streams. However, a reconnaissance survey conducted by the U.S. Fish and Wildlife Service (USFWS) indicated that mussels were scarce in these streams due to channel modification, agricultural runoff, and irrigation withdrawals. If zebra mussel proliferate in the White River, their introduction into the smaller project area streams is likely inevitable with or without the project.

Comment 4. On Page EIS-30 Table 4-1, Comparative Impacts of Alternatives of the Draft Environmental Impact Statement (DEIS), it is stated that "mussels are not plentiful in the tributary streams". We understand that only limited sampling for mussels in the tributary streams was conducted at eight bridge locations. Bridge locations are known to represent disturbed stream areas, and the mussel populations at these sites unlikely represent the entire stream. We feel more intensive mussel surveys of tributary streams may be needed, particularly since records indicate Federally listed endangered mussel species are or have been known to occur in the White River Basin.

Response 4. During the general reevaluation study, the USFWS and Arkansas Game and Fish Commission (AGFC) voiced concerns about potential project impacts (i.e., temperature changes induced by import water, zebra mussel introductions) to mussels in the tributary streams. Therefore, the Memphis District Corps of Engineers funded a reconnaissance mussel survey by the USFWS. This reconnaissance survey was performed to determine the need for more intensive population surveys of the tributary streams. The USFWS conducted the reconnaissance survey on LaGrue Bayou because it was thought to be the stream most likely to contain viable mussel populations. However, the survey revealed only low-density mussel populations. Based on the reconnaissance survey results, the USFWS informed the Memphis District that more intensive surveys were not needed. The AGFC was informed of the survey results and the decision not to pursue additional surveys; the AGFC did not object to this decision. The Memphis District would reconsider the performance of additional mussel surveys if the AGFC can provide evidence to indicate the need for the surveys.

Comment 5. On Page EIS-20 Table 4-1, Comparative Impacts of Alternatives of the DEIS, there are discussions of larval fish entrainment studies for two years after project development. Biologists of this agency feel that the entrainment rate of 1.2 to 12% of all larval fishes is extremely high, especially for long-lived species such as paddlefish and sturgeon, because of the high discharge variability in the system and the long life spans of those species. A pulsed monitoring program should be used for post-project studies. Any significant losses of fishes directly associated with entrainment and/or impingement would require agreed upon compensation or mitigation measures between the Arkansas Game and Fish Commission, the U.S. Fish and Wildlife Service, and your agency as part of project expense.

Response 5. Most fishes that could be potentially entrained are shad (*Dorosoma* sp.) and minnows (*Notropis* sp., *Macrhybopsis* sp.). These taxa have extended spawning seasons or high fecundity, and are ubiquitous in the lower White River system. Their reproductive strategy is characteristic of species with high natural mortality of early life stages, and the predicted numbers that could be potentially entrained are relatively minor compared to total numbers that exist cumulative in inlets and other backwaters. Potential entrainment of paddlefish and sturgeon is improbable. Only one paddlefish larvae was collected during field studies and no sturgeon larvae were collected, indicating their rarity. Spawning occurs in spring when water demand is lower, and larvae quickly develop sufficient swimming capability to avoid entrainment later in the season. In summary, we consider that entrainment losses will not negatively affect the population integrity of fishes in the lower White River. However, we recognize the uncertainties in impact prediction and have agreed to monitor ichthyoplankton in the inlet channel. The Memphis District looks forward to working with the AGFC to develop a pulsed monitoring plan and to establish an entrainment threshold that would require mitigation if exceeded.

Comment 6. On Page 24 of the DEIS concerning water quality issues, we feel conducting

contaminant surveys before, as well as after project completion are necessary to insure that contaminant levels can be maintained at the lowest levels possible in irrigation water. It is not known if diversion of surface water for irrigation and the future operation of the irrigation system will cause any water quality problems resulting in significant adverse effects on fish and wildlife resources.

Response 6. Water quality and sediment sampling was conducted during the general reevaluation and will be conducted during construction. A water quality monitoring program will be established for the project to include gathering the necessary baseline data. Further discussion with appropriate agencies is necessary to develop the monitoring program.

Comment 7. On Page EIS-97 of the DEIS, it discusses the Grand Prairie Area Demonstration Project as one of five irrigation projects as part of the Eastern Arkansas Region Comprehensive Study. Two other irrigation projects would withdraw water from the White River in addition to the Grand Prairie Demonstration Project, one would withdraw water from Bayou Meto, and one would withdraw water from the Little Red River. The Draft Reports are lacking discussion of impacts regarding the other irrigation projects. While these project may be separate from a construction standpoint, in theory they are interconnected from a planning and ecological perspective. We, therefore, recommend that cumulative impacts for all five irrigation projects are thoroughly addressed in one scope of study and mitigation features are commensurate with other project planning for the life of the project.

Response 7. A section has been added to the FEIS that addresses cumulative impacts of other potential irrigation projects (i.e., Little Red River, Black River) on the White River basin. The Bayou Meto Basin Project would not utilize the White River as a water source. Any future study would analyze impact considering existing or authorized projects in place. However, at this time, the only planned, funded, or authorized project utilizing the White River or its tributaries excess water is the Grand Prairie Project. Also, the White River Navigation to Newport, Arkansas, General Reevaluation is quantitatively evaluating cumulative impacts associated with it and the GPADP.

Comment 8. On Page EIS-14 Alternative 7, 4.15 it is stated, "It is assumed that all new irrigation reservoirs would be built on agricultural land; approximately 8,849 acres of farmland would be lost to reservoirs". No guarantees have been made that new irrigation reservoirs would be built on agricultural land.

Response 8. The project was planned and evaluated with the assumption that the new irrigation reservoirs would be placed on the higher ground to utilize gravity flow for irrigation. Any variance would require that the farmer apply for and obtain an individual Section 404 (b)(1) permit. The NRCS currently estimates that approximately 200 acres of farmed wetlands would be lost to construction of on-farm features (i.e., reservoirs, tailwater recovery systems). Approximately 200 acres of farmed wetland or prior converted farmland

will be acquired and planted in bottomland hardwoods to mitigate these impacts. It is important to note that these are only estimates of the on-farm impacts and subsequent compensatory mitigation. The actual impacts and required mitigation will be determined as each on-farm plan is completed. Mitigation will be acquired in manageable tracts for the on-farm wetland losses by the project sponsor. The mitigation will be acquired at the same rate as the on-farm features are constructed.

Comment 9. We appreciate the Corps of Engineers efforts to acquire remnant prairie areas in fee title to offset losses of natural prairie and the proposal to restore vegetation within 300 miles of canal right-of-way (approximately 3000 acres). In order for the proposal to result in significant benefits to wildlife resources, prairie habitat should be restored on land adjacent to remnant prairies, and other acreage not conducive to prairie habitat should be vegetated with appropriate wildlife food plantings. Obviously, more information is necessary regarding the task of prairie restoration management and assessment.

Response 9. The Memphis District believes that prairie restoration is possible throughout the proposed canal system. Since a tallgrass prairie historically occupied this region, a high priority will be placed on restoring native prairie grasses. Studies will be conducted to establish the appropriate planting methodology and associated costs for establishing prairie grasses. If it is not economically feasible to establish prairie within the total canal area or if it is determined that certain sites are not suitable for prairie restoration, plantings of other vegetation that benefit wildlife will be made.

Comment 10. The EIS does not guarantee that groundwater resources will be protected by the project. There are no provisions that mandate farmers to stop or limit pumping water from groundwater sources and the local aquifers may still be depleted.

Response 10. The Corps does not have the authority to mandate that farmers stop or limit pumping from the aquifer. However, the Arkansas Soil and Water Conservation Commission has declared the Grand Prairie Area a critical ground water area and are monitoring the ground water problems in the area. The ground water users may take steps to limit further aquifer declines before any type of regulation is placed upon them. The project will provide increased irrigation efficiencies, increased storage, and an alternate source of water to reduce the demand on the aquifer to its safe yield. Without the project, the aquifer will be depleted.

Comment 11. It is important to conduct long term studies (pre and post project monitoring) to determine project effects on fish and wildlife resources of the White River. The Grand Prairie Irrigation Project will affect the hydrology of the White River and its tributaries. The change in hydrology, depending upon the time and extent of these changes may adversely impact the ecological integrity of wetland habitats, more particularly those larger tracts of lands held in public trust. These include Federal and State Wildlife Management Areas and National Wildlife Refuges. The wetlands associated with the Cache and Lower White Rivers

in Arkansas have received special designation in the United States as "Wetlands of International Importance" by the Ramsar Convention. At this time, there are no habitat models available that can adequately predict irrigation project impacts. Studies are needed since little is known about the ecology of the White River, and it is difficult for this Environmental Impact Statement to properly address impacts on ecological functions without basic biological information.

Response 11. A long-term monitoring program will be developed for the project. Your office will be consulted on the design of this monitoring program.

XIII. South Arkansas Landowners Association
Suite 1900
111 Center Street
Little Rock, Arkansas 72201

Comment 1. Fisheries Habitat. The White River, Bayou Meto, Mill Bayou, Bayou LaGrue and other streams and lakes in the Grand Prairie Area have generally been classified by the U.S. Fish & Wildlife Service as good fisheries. Many Landowners, visitors and residents in the region use these areas extensively for fishing. Any channel enlargement, alteration, dredging or clearing of natural water ways to accommodate transmission or storage of water would, in our view, negatively impact the stream morphology, region-wide. In addition, we believe removal of any type of vegetation along streams and waterways, whether through deliberate project efforts, or by scouring resulting from unnaturally increased stream flows, will also have a negative effect. How would any irrigation project impact on these concerns?

Response 1. Some limited clearing would have to be performed along the top bank of one side of some existing channels in order to construct weirs. These disturbed areas would be allowed to regenerate naturally following construction, and the losses to wildlife habitat would be mitigated. Also, additional field investigations will be made by an inter-agency team to determine if any of the proposed weirs need to be relocated or redesigned in order to avoid or minimize adverse impacts to riparian plant communities. These weirs will be beneficial to fish and wildlife habitat as most of the streams are currently dry for long periods during the year.

Comment 2. Increased Pesticide/Herbicide Contamination. Any type of tail water recovery system would clearly increase the inflow of pesticides and herbicides to the water ways, streams and/or lakes in the region, as well as absorption of these chemicals into vegetation and soils in the area. Has there been any study of the effects of increased toxins upon the fish and other aquatic life found in the affected water ways? In our members' local area, even without the presence of a super-regional district and concentrated activity as is contemplated by this project, there has been a noticeable increase in the past few years in the number of game and other fish caught which exhibit excessive lesions and infected areas

along their skin surfaces. Without scientific study, the origin of this trend cannot be known for sure, although we believe it is the result of increased contaminants in the water from agricultural run off as more land has been cleared in the region for agricultural purposes. To what degree would any project contribute to this concern?

Response 2. Tailwater recovery systems would decrease the runoff from agricultural areas into are self-contained systems that do not allow the inflow of contaminates into existing waterways, streams, and/or lakes.

Comment 3. During the summertime, minimum stream flows and/or satisfactory stream/lake levels would have to be maintained, to accommodate navigation and keep from destroying aquatic life and wetlands vegetation. To what degree would a project impact on these fishery needs? What will be the impact of spoilage as a byproduct of increased dredging to maintain a navigation channel in the White River as project pumping reaches peaks levels during the normally dry growing season?

Response 3. Pumping would cease once river stages fall below the minimum flow requirements identified in the Arkansas State Water Plan. Changes in water levels during pumping would be less than a foot and would not effect habitat requirements of fishes during low flow season. Regarding the effects on navigation, the economic effects to navigation caused by diverting water during the summertime have been estimated and are presented in the Economic Appendix. They are based on the assumption that no additional dredging would be undertaken to offset any of the potential effects of the project. Similarly, it was assumed that no changes to the reservoir operating plan on the upstream reservoirs would be made to offset any impacts.

Comment 4. Wetlands Preservation. Much of the habitat along the natural waterways in the region, including Bayou Meto, Mill Bayou and Bayou LaGrue, consists of green timbered wetlands. What is the potential for the project's putting additional stress on or in effect destroying the vegetation and habitat in these areas? Planting prairie grass vegetation along transmission canals rights of way, while a noble effort, doesn't constitute a rational alternative to minimization or mitigation of environmental damage. Because of these concerns alone, natural waterways should simply be left out of the project plan for moving or storing water.

Response 4. The elevational differences between the tops of some of the proposed weirs and the respective channel top banks is as little as one foot. Water pooled behind these higher weirs could possibly saturate the soil adjacent to the channel and impact riparian plant communities. These impacts would be restricted to areas immediately adjacent to the channel. An inter-agency team will conduct field investigations to determine if any weirs need to be redesigned or relocated in order to avoid or minimize impacts to riparian woodlands. The prairie grass restoration plan is a separate environmental feature, and it is not intended to offset or mitigate any adverse environmental impacts. Four hundred thirty-

six acres of cleared land will be obtained and reforested to mitigate construction impacts to woodlands.

Comment 5. Increased Salinity. Is there any possibility that water might be pumped or released from the White River on occasion into natural water ways targeted to be transmission canals, when the salt content could be high enough to damage the aquatic regime? Since to some degree these water ways are being viewed by the Corps and the local Sponsor as what could be viewed as “holding ponds” for irrigation water, under the studies, water with somewhat high salt content could be placed in the reservoir areas and after sufficient detention time it could then be pumped out to the crop lands. This salt content might not damage man-made canals or ditches, or even the crop lands in the short term, but it could severely degrade the water system in any natural water ways holding or carrying this water. One control could be that the Sponsor District would be charged with responsibility to measure and control salinity entering the system, and is prohibited from introducing releases from the White River into any natural water ways affected by or carrying water in or out of the project area if, in fact, the water has a sufficiently high salt content that it should not even enter the system because of the prospect of long term damage to these water ways. Again, if the natural water ways are just removed from the project plans, contamination resulting from increased salinity would be effectively eliminated.

Response 5. The White River generally has good water quality and less salinity than ground water. Salinity should pose no significant problems to natural aquatic habitat. Water quality monitoring will be an integral part of this system. Monitoring will keep us apprised of any problem that might occur.

Comment 6. Authority for Making Critical Decisions. Under State law the super-regional irrigation district which is the project Sponsor has negligible requirements for qualifications of the individuals who are endowed with district governance. It is governed by five elected district commissioners, none of whom is required to represent any interest of the general public, or have any background in or take into account the natural sciences, environmental conservation or other related disciplines fostering awareness of the delicacy of the ecosystem which is to be affected by this project, nor to consider the environmental impact of their actions once a project is in place. Thus, even though the Corps is charged, among other scientifically based responsibilities, with preparing an environmental impact statement on the project, the district commissioners may have unfettered management authority with respect to environmental considerations once this project begins operations, unless significant limitations are placed on their discretion in these matters. Accordingly, if these district commissioners prove to be unresponsive to these concerns during the operational life of the project, for all intents and purposes fish and wildlife values along natural water courses affected by the project could take a back seat to the management, movement and withdrawal of the water from these areas, and the remedy of affected landowners to replace the commissioners by voting at the next election will be a hollow one once the damage is done. The Sponsor will have no substantial assets to make remuneration for damaged parties

or properties, other than possessing the power to assess “benefits” - taxes by any other name- against the very land which has been damaged. Accordingly, it is not only appropriate and prudent, but essential, in light of the potential damage which could be inflicted on the natural water ways and water courses included in the project scope, to impose significant and scientifically-grounded environmental parameters as overriding paradigms in the operation of this project. Finally, in this regard, what weight would be given to the interests of riparian landowners, including those who are not farmers, whose lands would be affected by project operations?

Response 6. The operation and maintenance of the project will be governed by an operation manual prepared by the Corps. The operational limits specified in this manual will be the operational limits analyzed in the EIS.

Comment 7. Impact of Discharge on Downstream Natural Waterways. Has the Corps specifically considered the potential negative effects of increased agricultural run-off, including herbicide and pesticide concentrations, and the impact of increased scouring and siltation in natural water ways and lakes in the downstream runoff area, whether inside or outside the Sponsor’s district boundaries? We note that your educational brochure refers to these watercourses as “existing channels,” surely a euphemism chosen to reinforce the belief that this “channel” may be easily manipulated and controlled for human endeavor. Our organization believes that this land, which supports significant game and non-game wildlife and migratory waterfowl, will be adversely impacted with long-term and irreversible consequences for the natural wildlife in the affected areas. Claims of mitigation in other areas, whether by induced flooding of upland crop land during winter months is of more theoretical than real benefit when the practical difficulties of maintaining this part of the project’s plan are considered, as pointed out below.

Response 7. Impacts to existing channels were analyzed from a hydraulic, hydrologic, and water quality view point to insure that the existing streams functioned as usual for bankfull events but held water during low water conditions. Since the irrigation flows have very good water quality, the project will not have any adverse impact to the existing channel’s water quality. A plan to monitor water quality will be developed.

Comment 8. It is noted in the section titled “Project Description” on page 2 of the brochure available at the September 15, 1998 workshop meeting, that “{a}n important component of the selected plan is the winter flooding of 38,529 acres of harvested rice fields (on an average annual basis) for waterfowl; the flooding of crop land for waterfowl foraging habitat has been identified as critical in meeting habitat requirements of waterfowl in Arkansas as well as the entire Lower Mississippi Valley.” However, we have been unable to determine exactly where funds would come from to pay for the winter flooding, since farmers in the project area will have to drain their lands in the fall to effect the harvest. Does the Corps’ and the Sponsor’s plan require these farmers to store that unspent irrigation water on their property, or on the property of others? What measures have been undertaken to ensure that

the landowners will not have to, in effect, pay for flooding their fields twice? Are the Corps' calculation of 38,529 acres (on an average annual basis) based on the number of landowners who presently have their own reservoirs for storing spent irrigation water during harvest time and are willing to pay the costs associated with reflooding their fields? We suspect that many farmers in the proposed project area do not have existing on-farm water storage areas nor the financial means to remove land from production to convert into on-farm reservoirs, and will otherwise be unable or unwilling to pay, at the projected water sale rates, for a second, winter flooding which is stated to be critical in meeting habitat requirements of waterfowl. Has the Corps developed a "worst-case" scenario if there is minimal winter flooding, say at historical levels, in the claimed 38,529 acre for economically- or weather-based reasons? And in light of this consideration does the cost-benefit ratio of the project need to be adjusted in the Corps' annual economic analysis, and thus do the overall numbers need to be reviewed, to take this likelihood into account?

Response 8. The benefit-to-cost ratio does not need to be revised. The 38,529 acres is the amount of winter waterfowl acreage that could be flooded, on an average annual basis, utilizing all sources of irrigation water, not just the water provided by the project. In fact, 17,400 acres of this figure would be flooded from existing sources. The remaining 21,129 would be flooded from project provided sources. A project benefit is claimed only on the 21,129 acre figure. Further, it is important to note that the project is economically justified absent the waterfowl benefits. The local sponsor will be contractually bound by the PCA to insure the winter waterfowl flooding and the additional storage.

Comment 9. True Beneficiaries. While we note that the Corps has projected a 1.2 to 1 Benefit-to-Cost Ratio, we feel that the estimated cost of \$270,512,000 for construction of this project is an outdated and far too conservative estimate, based on environmental and other considerations we do not believe have been adequately taken into account. The number of landowners benefitting from this costly and environmentally suspect project is realistically measured in hundreds and not the thousands. However, the number of Arkansas and U.S. taxpayers potentially paying for the States' share of this "demonstration" project is measured in the hundreds of thousands and hundreds of millions, clearly a majority of taxpayers supporting a minority of beneficiaries. We feel that if this expenditure were put on a ballot, it would not receive enough public support to bring it to fruition because of its questionable economics and most certainly negative environmental impacts on natural waterways and wildlife inside and outside the grand Prairie area.

Response 9. The benefits were based on an analyses of National Economic Development Benefits, or benefits to the nation as a whole for the continued productivity of the Grand Prairie Region. The local economic benefits will be much higher. The costs were developed by the project team including a cost engineer and included cost contingencies. The cost estimates were reviewed by an independent technical review team. The detailed cost estimates are included in Volume VII for your review. The cost data is in October 1996 price levels. The costs and benefits are converted to an annual costs for an accurate comparison

of costs and benefits. The environmental impacts have been examined using the best available scientific techniques and experts in various fields. The impacts are minor and the benefits substantial.

XIV The Nature Conservancy
601 North University Avenue
Little Rock, Arkansas 72205

Comment 1. The Nature Conservancy has reviewed the above-reference GPADP and the related documents. We are greatly concerned that withdrawals of White River surface waters for irrigation will impact the hydrology of the Big Woods rivers and wetlands, and disrupt the complex interconnected functioning of this ecosystem. We are further concerned that this disruption will damage the natural values of this unique system.

Response 1. A multi-agency team led by the Arkansas Natural Heritage Commission and the Natural Resources Conservation Service evaluated the effects of proposed water withdrawals on White River floodplain wetlands. This study was conducted within the White River National Wildlife Refuge west of Clarendon, Arkansas, just south of Hwy. 79. Findings of this analysis are summarized in the DEIS. The study found the impacts to be minimal.

Comment 2. Of still greater concern is the cumulative impact of this and other water development and navigation projects at various stages of planning and implementation. In addition to the GPADP, three other irrigation projects are under study as parts of EARCS will also withdraw surface water from the White River on its major tributaries the Black and Little Red rivers. In addition a Congressionally authorized navigation improvement project on the White River is under study. These planned projects will affect stage levels on the White River in a cumulative manner. The environmental effects of GPADP and the other projects on the Big Woods cannot be evaluated without a comprehensive study of all four irrigation projects and the navigation project. The Nature Conservancy strongly urges the Corps of Engineers to conduct comprehensive studies of this ecosystem and prepare an environmental impact statement that addresses the cumulative impacts of the irrigation and navigation projects together. Analysis of cumulative impacts is required under the National Environmental Policy and regulations of the Council on Environmental Quality.

Anticipated cumulative effects include:

1. The drying of all types of wetlands in the system, with changes in vegetation types, affecting extensive acreage of private, state and Federally-owned bottomlands and wet woods, including some 300,000 acres of publicly-owned wetlands of international significance as recognized under the Ramsar Convention.

2. Decline of a diverse community of aquatic species, especially mussels, which may be affected by reduced water levels that cannot be evaluated without study of cumulative impacts.

3. Shifts in vegetation types away from those that support declining Neotropical migratory birds and reduced habitat quality for these conservation priority bird species that require forests for breeding.

Response 2. A section has been added to the FEIS that addresses cumulative impacts of other potential irrigation projects (i.e., Little Red River, Black River) on the White River basin. The Bayou Meto Basin Project would not utilize the White River as a water source. Any future study would analyze impact considering existing or authorized projects in place. However, at this time, the only planned, funded, or authorized project utilizing the White River or its tributaries excess water is the Grand Prairie Project. Also, the White River Navigation to Newport, Arkansas, General Reevaluation is quantitatively evaluating cumulative impacts associated with it and the GPADP.

DEIS

Comment 3. The survey for mussels is inadequate for the small streams and bayous to be used by the project, and mussel beds are present.

Response 3. A reconnaissance mussel survey of LaGrue Bayou was conducted by the U.S. Fish and Wildlife Service (USFWS) in order to determine whether more intensive surveys needed to be conducted within the tributary streams. LaGrue Bayou was chosen because it represents the larger tributaries and because the biologists thought that it was the stream most likely to contain at least a moderate mussel population. The survey indicated that mussels were relatively scarce in LaGrue Bayou, and the USFWS concluded that agricultural runoff, irrigation withdrawals, and channel modification were the primary factors limiting the mussel population. Additional surveys will be performed if evidence that there are moderate to high populations of mussels in any of the tributary streams is found.

Comment 4. The ecological effects of converting 'natural' drainages to conduits and reservoirs are not adequately considered.

Response 4. The existing streams are already being used for irrigation. Irrigation dams and weirs are common throughout the larger to moderate size streams. Water is pooled behind these structures and withdrawn for irrigation. Many of the streams are severely depleted of water during the growing season, especially during periods of little rainfall. The GPADP would insure that minimum pool elevations are maintained year-round within these streams. A fishery study conducted by the U.S. Army Waterways Experiment Station projects substantial benefits to tributary stream fisheries. Some of the higher weirs could induce soil saturation immediately adjacent to the channels, impacting riparian plant

communities. An inter-agency team will conduct field investigations to determine if any of the proposed weirs need to be redesigned or relocated in order to avoid or minimize impacts to riparian woodlands. This team will be comprised of representatives from the Memphis District COE, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Arkansas Game and Fish Commission, Arkansas Natural Heritage Commission, and Arkansas Department of Pollution Control and Ecology.

Comment 5. The potential effects of biocides, heavy metals and nutrients picked up by irrigation water in the system, and moving into the White River National Wildlife Refuge are not considered.

Response 5. Water quality studies were performed and did not indicate problems with contaminants moving in the irrigation system. The GPADP should not adversely impact existing water quality or the refuge. The on-farm tailwater recovery systems are self-contained systems and should limit agricultural runoff into natural streams. A monitoring program will be developed in conjunction with resource agencies to indicate if problems develop.

Comment 6. Infestation by the zebra mussel is likely to make the project uneconomical to operate.

Response 6. The potential effects of the zebra mussel have been considered in development of the project costs including operation and maintenance costs. Detailed designs to offset potential problems will be developed during plans and specifications.

XV. Arkansas Natural Heritage Commission
1500 Tower Building
323 Center Street
Little Rock, Arkansas 72201

CANAL AND PIPELINE CONSTRUCTION IMPACTS

Comment 1. Both (2) crossings of the ANHC Railroad Prairie Natural Area (please refer to the attached copy of Wetland map 1-B, Volume 8 of the GRR) may result in conversion of use on lands bought with Land and Water Conservation funds and thus may require replacement. The Corps of Engineers (CORPS OF ENGINEERS) should negotiate these issues with the National Parks Service and its representative, Arkansas State Parks. ANHC will participate as appropriate.

Response 1. Concur. We appreciate the offer of assistance from the ANHC.

Comment 2. At the crossing site of the Railroad Prairie Natural Area east of Hazen

(Wetland Map 1-B), a pipeline is shown leaving the canal and paralleling the south side of the Natural Area before crossing it toward the north. Impacts of this line would be significant, but could be avoided by having the line parallel the north side of the Natural Area.

Response 2. Concur. The pipeline will be relocated to avoid the prairie.

Comment 3. Downs Prairie Registry Area (please refer to the attached copy of Wetland Map 1-C, Volume 8 of the GRR), although not identified by name, is crossed by a line. This appears to be a situation where the intent was to direct the line around the prairie, but layers in the CADD were not registered properly. This error should be corrected.

Response 3. Concur. The alignment error has been corrected; the Downs Prairie will be avoided.

Comment 4. Fairmont Prairie is crossed by a canal (please refer to the attached copy of Wetland Map 3-B, Volume 8 of the GRR). We have previously requested that the canal be shifted to the other side of the county road here to avoid the prairie. If that shift is impossible, the loss of prairie should be mitigated.

Response 4. Concur.

Comment 5. At any place where prairies are crossed by the project, prairie sods should be removed to be used in restoration of the affected area or some other appropriate area.

Response 5. Concur.

Comment 6. Pipeline 1500.06 (please refer to the attached copy of Project Map 1-C, Volume 8 of the GRR) appears to cross a steep ravine. If so is this avoidable?

Response 6. This pipeline alignment will be examined and relocated if possible to minimize effects.

IMPACTS OF WATER WITHDRAWALS ON WHITE RIVER BOTTOMLAND FOREST AND WETLANDS, INCLUDING CUMULATIVE IMPACTS

Comment 7. This agency participated in a study to examine impacts of water withdrawals on bottomland forest and wetlands (outside of the channel of White River). This study indicated that possible significant reductions in flood flows would be caused by the project, but that these changes would be offset by artificially high flows from upstream releases from dams. Therefore, adverse impact would probably not be unacceptable. However, it is likely that any other major withdrawal of water from the White River would, in combination with

those from this project, have major adverse impacts on hydrology and vegetation in the White River bottomlands. Therefore assessment of cumulative impact is warranted.

Response 7. Analyses of cumulative impacts have been incorporated into the FEIS. If any pre-authorization studies for these projects are conducted in the future, it would be assumed that the GPADP is in operation. The impacts of the GPADP are being considered in the White River Navigation to Newport, Arkansas, General Reevaluation.

IMPACTS ON STREAMS OF THE GRAND PRAIRIE

Comment 8. It is impossible for us to tell whether flow rates in natural watercourses will be appropriate to maintaining natural systems along these streams. Has an analysis of this been done?

Response 8. In streams that are currently used for irrigation water supply, the streams are essentially drained for irrigation during the irrigation season. With the project, weirs will be placed in the natural channels to maintain a minimum water level. This minimum water level would provide a pool of water during the irrigation season. Minimum pools must be maintained for the system to operate efficiently. In Volume 3, stream profiles are provided in Plate III-C-18 and Plate III-C-19 for with and without project conditions. Stage-frequency curves are provided in Plate III-C-20. Volume 3, Section 3-C-05 Existing Streams, discusses the designs used.

Comment 9. The large number of weirs (120) constructed in natural waterways as a part of this project will have major adverse impacts. The direct impacts caused by clearing and filling in wetlands will be mitigated. However, it is impossible, from the data provided, to determine the effects of impoundment behind these weirs on riparian vegetation. We suggest that a multi-agency group be assembled to determine which weirs are likely to have adverse impacts, and determine whether the impacts can be reduced through relocating the weirs or through other means.

Response 9. Concur. A multi-agency team will conduct investigations of proposed weir sites. If necessary, weirs can be relocated or redesigned in order to avoid or minimize impact to riparian vegetation.

PRAIRIE RESTORATION ON CANAL RIGHTS-OF-WAY

Comment 10. We believe that the Coordination Report is in error when it states that "The Corps has proposed to obtain the remaining relict prairies through fee title purchase or conservation easement." (P, 39). Although this is a laudable goal and has been the goal of ANHC for many years (we have purchased fee or easements on 4 tracts), such a statement must be tempered by the qualifications that such purchases must only be from willing sellers and at a price related to fair market value. Any threat of condemnation will only result in

alienation of the families that have protected the remaining tracts at personal financial sacrifice, and willingness to pay an inflated price for areas of high conservation value will ultimately prove self-defeating.

Response 10. Concur. The only potential acquisition of existing prairie would be to mitigate adverse project impacts to prairie.

IMPACTS TO GRAND PRAIRIE WETLANDS FROM ON-FARM CONSTRUCTION

Comment 11. ANHC has noted increasing numbers of permit applications for building on-farm water facilities in naturally vegetated wetlands in the Grand Prairie region, land to some extent throughout eastern Arkansas. Construction of this project may increase this, and the planning process and impact assessment should account for this trend and try to minimize it through encouragement of water collection and storage facilities in prior converted wetlands, cropped uplands, or farmed wetlands. Landowners should be notified from the outset that they are responsible to comply with all requirements of Section 404 of PL 92-500. Consideration should be given to creation of one or more mitigation bank sites in the Grand Prairie area to ensure that off-site mitigation is done most effectively. It may be appropriate in some cases to mitigate some farmed wetland loss with prairie wetland restoration rather than bottomland forest wetland restoration.

Response 11. Concur. Individuals would still be required to obtain permits for on-farm features and would be required to comply with the requirements of PL 92-500. Measures will be investigated to ensure mitigation is done most effectively. The NRCS currently estimates that approximately 200 acres of farmed wetlands would be lost to construction of on-farm features (i.e., reservoirs, tailwater recovery systems). Approximately 200 acres of farmed wetland or prior converted farmland will be acquired and planted in bottomland hardwoods to mitigate these impacts. It is important to note that these are only estimates of the on-farm impacts and subsequent compensatory mitigation. The actual impacts and required mitigation will be determined as each on-farm plan is completed. Mitigation will be acquired in manageable tracts for the on-farm wetland losses by the project sponsor. The mitigation will be acquired at the same rate as the on-farm features are constructed.

FEDERALLY LISTED SPECIES

Comment 12. Since we initially provided information to you on species of concern, an eagle nest has been recorded within the project area east of Stuttgart (please refer to attached data print-out for details on this occurrence). No canals or pipelines appear to be located near this nest.

Response 12. Correct. No canals, pipelines, or other structures are proposed at this site.

GENERAL CONCERNS

Comment 13. It appears to us that too many of the key mitigating features of the project have been left as voluntary actions by the landowners. Unless the project actually results in recharge of the alluvial aquifer, it must be considered a failure. Such a measure of success should be included in the project, and failure to meet that objective should result in financial penalties being imposed on the project sponsors. Such a measure could also be developed for individual tracts: unless use of groundwater is reduced, additional financial charges should be levied.

Response 13. The mitigation features include mitigation lands to offset direct project losses. The waterfowl features, prairie restoration, measures incorporated to increase the habitat value of reservoirs, and the preservation of the alluvial aquifer are conservation measures not mitigation features. Other project features have incidental environmental benefits including fisheries in natural streams and reservoirs. Waterfowl flooding will be incorporated into the operation and maintenance manual referenced in the Project Cooperation Agreement binding the sponsor contractually to insure the average annual waterfowl benefits are realized. The sponsor will also be bound through the PCA to insure that the additional storage and conservation measures are implemented. The state of Arkansas has declared both the alluvial and Sparta aquifers in the area to be critical. The state also has jurisdictional authority for regulating ground water withdrawals. Without the project, the aquifer will be depleted. The project will provide an alternative source of water to protect and preserve the aquifer.

XVI. Arkansas State Highway Commission
P.O. Box 2261
Little Rock, Arkansas 72203-2261

Comment 1. The water intake facility near the new White River Bridge at DeValls Bluff will need an access road. This access is shown in the curve of the newly realigned U.S. Highway 70. Construction of the access road will require right-of-way easements and construction upon these easements. The intake canal and pump facility could present navigational problems at the new bridge during and after construction. Questions that arise in this location are: Will the Corps of Engineers remove the existing railroad truss bridge? Will the construction of the intake have any impacts upon the new highway bridge such as deposition, scouring or navigation?

Response 1. The intake channel was designed to have no adverse impacts associated with deposition, scour, or navigation in the White River channel. The Corps has no plans to remove the railroad truss bridge as part of the project.

Comment 2. Volume 9, Appendix C, Environmental, page II-3, 1, states "Environmental

review of canal/pipeline alignment identified several opportunities to relocate these items into road rights-of-way or open land to minimize habitat losses.” If the Corps plans to implement such a plan, coordination and permitting from AHTD and Federal Highway Administration will be needed. AHTD plans to widen selected Federal and State Highways within the project area. It is suggested that the Corps of Engineers initiate early coordination with AHTD to identify, modify, design and construct water conveyance structures to meet AHTD and Corps specifications. Detailed coordination between our two agencies is desirable to ensure a smooth transition with decreased costs to the taxpayers.

Response 2. The Corps will initiate early coordination to ensure the optimum location of facilities and decrease costs to the taxpayers.

XVII. Terry W. Tucker
2957 West Country Club Road
Searcy, AR 72143

Comment 1. The EIS mentions that 38,525 acres of rice and agricultural fields will be flooded to enhance winter water for waterfowl. This is admirable and needs to be implemented in the project. My question is: Who will get to hunt these waterfowl, the general public or just those individuals privileged enough to own the land? 270,000,000 dollars is a lot for a few hundred hunters to enjoy and enhance their hunting. If there is such a large amount of acreage to be enhanced with winter water, could not some of the land be used for waterfowl rest areas. Even moist soil management areas could be used by migratory shorebirds. This would keep waterfowl in the area and decrease the likelihood that waterfowl would be burned out of the area. But nowhere in your documents do you mention specific rest areas for waterfowl. This would be a small price to pay for such an ambitious project.

Response 1. At present, the GPADP provides for the winter flooding of harvested rice fields on private lands. Any public use or designated rest areas would be at the discretion of the local sponsor and private landowners. A separate environmental study has been initiated to examine the possibility of adding additional environmental features to the project.

Comment 2. Your documents note that the project will enhance project sloughs and bayous. I do agree that these streams would be improved with water catching weirs. I agree that the aquatics, benthics and fisheries of these sloughs would be vastly improved. But again my question is: Will the public be allowed to fish these waterways? Who will have access to these fisheries and what other activities will be allowed on these waters?

Response 2. Public access to these streams would not change from present conditions. Public access to project areas will be examined in the additional study of environmental features. The sponsor is considering providing public access where safe on irrigation district

owned lands.

Comment 3. In Volume 9, Section 1, part II-08, Table 1, Screening of Mitigation Alternatives, the CORPS OF ENGINEERS says "Development of Public lands within the study area is deleted", because "Within the Wattensaw WMA, even extremely intensive management would not produce the needed management credits. There is hardly any cleared bottomland that would be suitable for bottomland hardwood restoration. Each refuge contains only a limited amount of prior-converted and/or farmed wetland that would be suitable for bottomland hardwood restoration. Also, since most of the refuge lands are typical bottomlands, sites would not be available for upland hardwood restoration." My question to this statement is where are you looking? There are several areas. Several farmed wetland areas around Wattensaw would make an excellent candidate. You do mention that bottomland hardwoods would be planned, where? This is not a big question. Most wetland projects are required to have these lands available before such a project can be implemented. Again, I ask where is this mitigation land going to be located?

Response 3. There are numerous sites within the project study area that would be well suited for bottomland and upland hardwood reforestation. However, most of these sites are privately owned. Most cleared lands in public domain have either been reforested or targeted for reforestation, moist soil units, etc. Therefore, acquisition and reforestation of privately owned cleared lands is the logical option. An inter-agency team will select mitigation sites. Lands adjacent to or in close proximity to existing large tracts of woodlands will be targeted for acquisition. Potential mitigation sites adjacent to Wattensaw WMA, White River National Wildlife Refuge (NWR), and the Cache River NWR will be given the highest priority.

Comment 4. A comprehensive environmental analysis to assess changes in the water quality, turbidity and chemical load from herbicides, pesticides and other agricultural chemicals are suggested before the project is initiated. The section on hazardous materials in the region and its impacts upon this study were weak. Your report did not mention several water chemistry parameters but only looked at the present situation. The study did not predict the impact of taking good quality White River water and the impact the heavily agricultural usage area will have upon this water, before it is returned to the White River. There are several studies about agricultural runoffs and toxic level buildups of heavy metals (lead, copper, chromium, selenium, silver, aluminum) and increased levels of residual agricultural chemicals. Does the CORPS OF ENGINEERS plan to address these environmental issues before the project is started?

Response 4. Water quality issues in the report dealt with pumped irrigation water to the point where farmers pulled water from the delivery system to their farms. Our delivery system will not adversely affect existing water quality. In fact, water quality should be improved because there will be a reduction in groundwater use which, in turn, will decrease the salinity of water being used to irrigate. Also, tailwater recovery systems will allow

contaminants in irrigation water to settle out before being introduced back into the natural system. Analyses indicate that the level of contaminants entering the White River after the delivery system should be less than what is entering the system today. In addition, a monitoring plan will be developed in cooperation with resource agencies to insure identification of any effects.

Comment 5. Pumping water from the White River will introduce zebra mussels into local streams, lakes and tributaries of the White River. The zebra mussel will definitely have an impact upon the pumps, weirs and water control structures of this project. So get ready.

Response 5. Possible effects of the zebra mussel will be considered in developing project features and costs. The detailed design of project features will consider the possibility of zebra mussels.

Comment 6. The biggest concern I have for the project is the cumulative impact. This demonstration project is just that. It will demonstrate that water removed from the river can and will be used for irrigation. But the EIS does not take into account the cumulative impacts for all five irrigation projects that will be implemented if this project is a success. It would be nice to know how much water in cubic feet per second will be removed from the river for all the projects. With the building of the Montgomery Point Lock and Dam, the need for a deeper navigation channel and dams on the upper reaches of the river, the designation to RAMSAR as a river ecosystem of international importance is diminished. This project warrants and needs a basin wide investigation of impacts caused by current and future Corps of Engineers projects.

Response 6. A section has been added to the FEIS that addresses cumulative impacts of other projects, including the other irrigation projects, on the White River basin. Any future study would analyze impact considering existing or authorized projects in place. However, at this time, the only planned, funded, or authorized project utilizing the White River or its tributaries excess water is the Grand Prairie Project. Also, the White River Navigation to Newport, Arkansas, General Reevaluation is quantitatively evaluating cumulative impacts associated with it and the GPADP. A section has been added to the FEIS that assesses cumulative impacts of the GPADP and the other potential projects. Any future pre-authorization studies for these projects would assume that the GPADP is in operation.

Comment 7. At this time I can only support Alternative 3, Conservation With Storage. This alternative maximizes the use of existing water sources to the extent practical. It promotes increased efficiency and usage of irrigation water, construction of new reservoirs and is the most cost effective method for irrigation. Alternative 3 yields a higher dollar return for each dollar invested. I know this does not address the dwindling groundwater problems but it would give enough time to access the impacts of all five irrigation projects, the Montgomery Point Lock and Dam and the proposed navigation project upon the White River Basin. This EIS is only looking at the narrow picture, the bigger picture is when you back up and look

at all its impacts.

Response 7. Conservation with storage is the most cost effective feature of the overall project. As such it is used to the fullest extent in conjunction with the other features of the overall project. However, it does not solve the area's severe water problems. Alternative 3, conservation with storage, can only irrigate an additional 9,100 acres for a total of 63,700 acres with 187,900 acres shifting to dryland practices. Alternative 3 will not provide additional time to study other projects. The life of the aquifer will not be lengthened since it provides such a small percentage of the area's unmet irrigation demand. The unmet demand far exceeds water provided by Alternative, 3 allowing the aquifer to be depleted by 2015. Also one of the total project's purposes is to maximize its net economic contribution to the nation. Building only the conservation features would leave large portions of the project unbuilt and forego substantial economic development opportunities. Further, it would not allow for any potential preservation of the area's alluvial aquifer. The loss of use of the aquifer would be a severe blow to the area's regional economy as the value of agricultural production decreases.

XVIII. Arkansas Historic Preservation Program
1500 Tower Building, 323 Center
Little Rock, Arkansas 72201

Letter received did not contain any specific comments.

PUBLIC REVIEW COMMENTS

GRAND PRAIRIE AREA DEMONSTRATION PROJECT GENERAL REEVALUATION REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT

WHITE RIVER

May 7, 1999

Colonel Daniel W. Krueger
Corps of Engineers-Memphis Division
167 North Main
Federal Building
Memphis TN 38103

Dear Colonel Krueger,

I am writing to provide the irrigation district's perspective on certain issues raised in comments to the EIS. Some of the responses indicated a thorough review of the report and the EIS. We believe that this project provides a great opportunity for us to maintain our irrigated agriculture, underground aquifers, existing economic level, and at the same time, provide for environmental enhancement and benefits for our extremely important waterfowl resources. We want to work with state and federal agencies and environmental groups to insure that the potential benefits of the project are fully realized. After reviewing the comments and working with the Corps on responses, we feel that it is important to express our views as the project sponsor, and the entity that will have the responsibility for operating and maintaining the project. The majority of the comments centered on a few major topics and we have listed the individual topics below, along with our views.

Will the project save the aquifer? Protection of the aquifer is one of the central reasons for the project. Prior to project reauthorization, we worked with our congressional delegation to have that purpose, along with waterfowl conservation, specifically added to the project. I would again like to emphasize that we, not the Corps or the state or any environmental groups, requested aquifer protection be added as a project purpose.

The Arkansas Soil and Water Conservation Commission has declared both the Sparta and Alluvial aquifers in our area as "Critical Groundwater Depletion Areas". State law requires the ASWCC to institute ground water regulation, in the designated areas, if actions are not taken to slow and reverse the aquifer depletion. Under existing law, we do not believe that regulation could be implemented that could save the aquifers. The Grand Prairie situation is so critical, that without the project, only drastic measures that would immediately destroy the regions' economy could possibly save the aquifer. The project provides the only means to save the aquifer and maintain our irrigated agriculture. Some have questioned if we would use the imported water. If the water is available, it will be used. Long-term water contracts will be signed by the landowner.

The primary benefits to the aquifers will be the result of decreased withdrawals. With the additional water in storage reservoirs, canals, and natural channels, vertical percolation in the prairie, which currently provides 18.2% (22,560 acre-feet per year) of the recharge will, surely increase. Increased recharge due to project features was not accounted for in the ground water modeling efforts. With the decreases in demand from conservation features and the supply from an alternate source, the groundwater depletion should be eliminated.

The irrigation district is currently participating in studies to add additional features for groundwater protection, wetlands protection, and waterfowl conservation. We will be cost sharing in these studies upon completion of NEPA for the project and execution of the PCA and will pay our share of the costs incurred prior to the PCA at that time. This appears to be much more than other groups are doing at this time to protect the aquifers.

There is no waterfowl plan? A draft joint venture plan was developed called "Grand Prairie Care". We attended several meetings over a period of months. The mission statement of "Grand Prairie Care" was, "Enhancement of existing agricultural land management to benefit farming operations, soil and water conservation, and water quality while creating and improving valuable habitat for waterfowl and other



IRRIGATION
DISTRICT

wildlife." The goal was, "To annually flood 45,000 acres of harvested and rolled rice fields and manage an additional 30,000 harvested and rolled acres to hold rain water in the Grand Prairie Irrigation District between 1 November and 28 February to: (1) improve management of residual rice straw and red rice; (2) reduce soil erosion and pesticide runoff; (3) improve water quality; and (4) provide dependable shallow wetland habitat for waterfowl and other migratory waterbirds." I have enclosed a copy of this draft plan and can provide the attendees who were present at the meeting for its development. The goals of the plan were used in project planning. Withdrawal constraints result in water availability to flood 38,000 acres on an average annual basis. The irrigation district wants to finalize the plan and sign joint venture agreements under the North American Waterfowl Management Plan. We invite you and other agencies to participate with us in this effort. However, with or without a joint venture agreement, the irrigation district is committed to operate the project to provide for the rolling and flooding of rice acres called for in the general reevaluation report.

Will the flooding for waterfowl occur? The irrigation district is committed to fulfilling its obligations for the flooding of rolled and harvested rice fields. This is becoming a more popular agricultural practice for management of stubble and red rice. The project will provide the additional water necessary for flooding the acreage. The irrigation district will contractually bind itself with the federal government in the Project Cooperation Agreement to provide this acreage on an average annual basis. We will participate in project monitoring in a plan developed by the Corps and resource agencies and provide incentives as necessary to ensure the waterfowl benefits. It will be done.

Will the additional storage and conservation features be constructed? Conservation and storage features are being constructed across the prairie now with little or no cost share. These features are simply cost effective. If project cost sharing is provided, the irrigation district's only concern with their implementation is the limits of funding. The irrigation district will again bind itself contractually with the federal government in the PCA to insure the levels of efficiency are reached and the additional storage is provided. The irrigation district realizes that the additional storage is needed for the delivery system to meet the area's needs.

Mitigation for on-farm features. The project plan calls for reservoir construction on farmland. The irrigation district requests that one or more suitable sites for mitigation of on-farm features be investigated to provide mitigation in manageable units and large enough tracts to maximize benefits to wildlife and the environment.

Public access. The irrigation district will provide public access on sites that the irrigation district owns in fee title where the access can safely be made. The district will own the locations of the pumping station and major structures. The majority of the canal system will remain in private ownership with the irrigation district having only an easement to operate and maintain the canal. Due to safety, operations, and maintenance concerns, boating will not be allowed in the canal system. Access will also be allowed at any in-line storage that the district owns. Modeling efforts have shown that a small reservoir will likely be necessary at the pumping station outlet to dampen the water level fluctuations. During preparation of the plans for this item, we will work with the Corps and the Arkansas Game and Fish Commission to maximize fish and wildlife benefits and public access at this site. Public access will likely be available on mitigation sites. We are also working with the Corps and other agencies on a study of additional environmental features. Though the Corps places a low priority on recreation, the irrigation district will place a priority on compatible access in this effort.

Pumping cutoffs. The irrigation district will bind itself contractually with the Corps to operate according to the pumping cutoff levels presented in the report and the EIS. The Corps and other agencies have analyzed the impacts on the White River from these cutoff levels and we will operate within these parameters.

The White River Irrigation District, as project sponsor, is committed to implementation of the project, including all of the project features, to achieve the most benefits for the people in the area. We have worked hard with the Corps and included environmental agencies to develop a sound project. We would like to continue to include environmental agencies during implementation of the project and development of additional features. Without the project, the aquifer will be lost and rice will no longer be a major crop on the prairie. With the rice goes the ducks. This project provides the only implementable solution to save the aquifer and the economy and produce environmental benefits for fisheries and waterfowl.

We appreciate the good work which the Corps is doing on our project and the "partnering" spirit which is present. We look forward to the installation of a project in which all of our natural resources and people are winners.

Regards,


Tommy Hillman,
President

TH/js

cc: Edward Lambert ✓

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"GRAND PRAIRIE CARE"

A Joint Venture Project of the
North American Waterfowl Management Plan

and

A Component of the Advanced Action Plan of the
Grand Prairie Irrigation Project

*** The following is a draft outline of potential project purposes, principles, and components of a "Grand Prairie Care" Joint Venture Project. These purposes, principles, and components have been developed within the premise stated at preliminary meetings of the Interagency Conservation Group (ICG) that an "advanced action plan" could be developed as a component of the Grand Prairie Irrigation Project (GPIP). The following thoughts are presented for the purpose of stimulating discussion, and to provide a starting point for further development of the Joint Venture Project; they do not yet reflect the thoughts of the ICG as a whole. In addition, it needs to be recognized that the following comments are restricted to the issue of winter water management, and do not attempt to address other potential conservation components of the total Irrigation Project at this time. ***

I. MISSION: Enhancement of existing agricultural land management to benefit farming operations, soil and water conservation, and water quality while creating and improving valuable habitat for waterfowl and other wildlife.

II. GOAL: To annually flood 45,000 acres of harvested and rolled rice fields and manage an additional 30,000 harvested and rolled acres to hold rain water in the Grand Prairie Irrigation District between 1 November and 28 February to: (1) improve management of residual rice straw and red rice; (2) reduce soil erosion and pesticide runoff; (3) improve water quality; and (4) provide dependable shallow wetland habitat for waterfowl and other migratory waterbirds.

III. PURPOSES OF THE ADVANCED ACTION PLAN:

1. Demonstration of the commitment of farmers in the Grand Prairie Irrigation District to the conservation of natural resources, including waterfowl, other wildlife, and soil and water quality, through the development of 75,000 acres of winter water management.

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2. Development and implementation of an operational, working partnership among the broad range of interests in the district, including farmers, state and federal agricultural and conservation agencies, and non-governmental organizations.
3. Development of baseline data which could be utilized for the development of cost-sharing ratios for water delivered to individual farmers by any future Irrigation District Project.

IV. PRINCIPLES UNDERLYING THE "GRAND PRAIRIE CARE" JOINT VENTURE PROJECT

1. Attaining the goal of the project would be beneficial to both the economy and conservation of natural resources of the District.
2. Individual participation in the project should be on a voluntary basis, although attainment of the goal is a collective commitment of the Irrigation District.
3. All farmers in the District should be afforded the opportunity to participate, and project components should be attractive to a broad range of farmers (e.g., large and small farms, corporate and family farms, conservation-oriented and production-oriented farms).
4. Incentives should be developed in order to provide rewards and recognition for individuals who contribute to the project goals.
5. Maximizing the use of private/state/federal partnerships in implementing the project will strengthen and broaden the underlying support for the project.

V. PROJECT COMPONENTS:

For preliminary discussion purposes, 5 potential project components are outlined below. They include:

1. water control structures;
2. irrigation water cost reduction;
3. short-term incentive payments;

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4. hunting lease technical assistance; and,
5. habitat restoration.

1. Water Control Structures:

a. Component Outline: This practice would provide water control structures to farmers in exchange for a long-term (preferably at least 10-years) agreement to manage the acreage affected by the structure to provide winter waterfowl habitat. There would be requirements and constraints associated with the practice that reflect conventional waterfowl and stubble management practices (rolling rice stubble, repairing and rebutting levees, no disking or burning of stubble, etc.), and related to the overall goal of the project to provide winter water from 1 November through 28 February. (Potential alternatives to this basic flooding periods are discussed in the next project component outline.)

This practice could be an extension of the existing cooperative "Arkansas Partners Project" being delivered by Ducks Unlimited, U.S. Fish and Wildlife Service, Arkansas Game and Fish Commission, and Natural Resources Conservation Service, or it could be delivered by Irrigation District personnel. Either course would require obtaining additional funding/personnel for delivery of the practice. Other alternatives which could be investigated include: (1) a redirection of existing Agricultural Conservation Program funds by the District Consolidated Farm Services Agency county boards which could accommodate at least some delivery without having to generate new money; (2) development of a project proposal by the District to obtain Sec. 319 (non-point source) funds for practice delivery; (3) use of Water Development Funds associated with water management and conservation efforts administered by the County Conservation Districts.

b. Incentives: The primary incentive is that the farmer receives financial assistance in the form of water control structures. These structures will obviously also help address his water management needs during the irrigation season.

c. Potential Partners:

- o Landowners/Farmers
- o Arkansas Game and Fish Commission

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- o U.S. Fish and Wildlife Service
- o Ducks Unlimited
- o Consolidated Farm Services Agency
- o County Conservation Districts
- o Arkansas Soil and Water Conservation Commission
- o White River Regional Irrigation Water Distribution District

2. Irrigation Water Cost Reduction:

a. Component Outline: The basic assumptions underlying this practice are that: (1) farmers will be required to pay the Irrigation District for water used and delivered by the Irrigation Project's system; (2) there could be varying cost structures incorporated into any payment system. If the Irrigation District accepts the commitment to meet the goal of this Joint Venture Project as part of an Advanced Action Plan of the GPIIP, it seems reasonable that the District could seek to recognize and reward farmers who, on an individually voluntary basis, help the District attain its winter water management goal. Inasmuch as the District will presumably be developing some sort of cost structure to farmers receiving water in order to offset District operations and maintenance costs, the District would be in a position to charge farmers at different rates based on their individual commitment to assisting the District as a whole meet its other Project commitments (e.g., winter water management). Thus, costs of irrigation water to farmers could be inversely proportional to the amount and duration of winter-flooded lands. For example, a farmer flooding many acres all winter could be required to pay less per unit of irrigation water than a farmer who flooded fewer acres for a shorter period, and the greatest cost of irrigation water would be assessed to farmers who did no winter water management of any type.

To illustrate the principle, consider the following conceptual framework which involves the use of "credits" in determining farmers' irrigation water charging rates.

1. A full unit of credit (1) would be assigned to an acre managed to hold winter water during the full baseline period of 1 November to 28 February.
2. 0.5 credits/acre would be assigned to land managed from 1 November to the end of duck season.
3. 0.75 credits/acre would be assigned to land managed from 1

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November to 15 February.

4. 1.5 credits/acre would be assigned to land managed from 1 November to 15 March.

A cost/unit irrigation water for a farm could then be developed on the basis of that farmer's total participation and contribution toward the District's winter water management goal, in relation to his irrigation water demands.

It is clear that this type of practice would need to be carefully structured to consider points such as: (1) the cost structure would have to be such that the total income for delivery of irrigation water would be sufficient to pay for total District operations and maintenance costs; (2) while acres of managed land over and above the minimum goal would be desirable, the District would probably have to have some sort of acreage cap, descending scale of credits, or other mechanism(s) to limit farmer participation to that desired and affordable by the District; (3) how much of a "credit" would be necessary to serve as an incentive for farmer participation; (4) would these "credits" go with a farm or field in the same way as a crop "base" does now; (5) how would "pumped" versus "managed" acres be factored into the equation; (6) what other water, soil, and/or wildlife conservation practices might also be factored into such a mechanism; and, there are clearly many more.

b. Incentives: The overriding incentive of this practice is that it makes the cost for future irrigation water directly related to a farmer's advance participation (between implementation of the Joint Venture Project and implementation of the Irrigation Project) in the winter water management conservation practice. Some of the advantages to the farmer are:

1. provides increasing incentives for longer duration and greater extent of winter flooding;
2. is 100% voluntary, but provides a significant financial incentive for choosing to participate;
3. provides some, but a reduced level of recognition and reward to farmers who may be providing less than optimal winter water management now (e.g., draining water off fields immediately after duck season);

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4. appeals to a broad range of farmers, from those who are driven entirely by the financial aspects of agribusiness, to those who are committed to water, soil, and wildlife conservation practices even at some considerable expense to themselves; and,
5. provides an opportunity for the farmers, and the District as a whole, to demonstrate through this Advanced Action Plan the extent and level of their individual and collective commitment to conservation.

This practice could be a key component of an Advanced Action Plan, and could also provide the District with baseline information for development of a cost structure. If the District stated that, through voluntary agreements between the District and the farmers, their level of winter water management between now and the availability of irrigation water from the Irrigation Project was going to be used to establish their individual baseline cost structure, there would immediately be created an incentive for "advanced action" by farmers.

However, a significant consideration with this practice would be to insure that farmers did not feel that there was any misrepresentation if an Irrigation Project fails to materialize for any reason. This concern is one of the reasons for developing and offering the complementary practices outlined in this proposal. We would need to make the "gamble" on the part of the farmer clear, but try to make it worth his while with other practice offerings, and a clear reward if the Irrigation Project is constructed and becomes operational.

c. Potential Partners:

- o Farmers
- o White River Regional Irrigation Water Distribution District
- o Natural Resources Conservation Service
- o Consolidated Farm Services Agency

(The latter two agencies could assist with the potentially significant compliance monitoring aspect that might be required for this practice.)

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3. **Short-term Incentive Payments:**

a. Component Outline: A practice could be developed in order to provide a per-acre payment for winter water management in fields from at least 1 November through 28 February. This would be similar to the USFWS ad AGFC "Cache/Lower White Rivers Private Lands Program" rice-field management practice. At \$3/acre paid for rolling stubble, repair of levees, and holding rainwater during that time period, the popularity of this practice exceeded the available funding. Funding within this Advanced Action Plan could be pursued by the District through several mechanisms, such as a Sec. 319 grant, through ACP (this practice has been recommended for funding to the State ACP Committee by several county committees from northeast Arkansas in recent years), or through Conservation Districts.

b. Incentives: The practice is voluntary, straight-forward, and already familiar to the farmers in the District. Financial incentives are directly proportional to their participation. However, a \$3/acre incentive may not be sufficient to persuade landowners to retain a flood on their enrolled fields through 28 February. This may or may not be critical, depending on the role that the District desired this practice to play in the comprehensive Joint Venture Project package.

c. Potential Partners:

- o Farmers
- o White River Regional Irrigation Water Distribution District
- o Consolidated Farm Services Agency
- o Arkansas Soil and Water Conservation Commission
- o County Conservation Districts

4. **Hunting Lease Technical Assistance:**

a. Component Outline: The leasing of waterfowl hunting rights on managed agricultural fields can provide important additional income to farmers/landowners. The Grand Prairie already leads the state in this long-established practice. However, the amount of leasing that goes on in even the Grand Prairie could probably be significantly increased. At the present time, there seems to be a substantial "market" for this commodity in the form of non-landowning duck hunters, particularly those located in the

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nearby large urban areas of Little Rock and Memphis. However, the "supply" of the managed, leasable fields seems to be insufficient at the current time to meet the demand. A program which would facilitate the connection of the supply and demand sides of this market should produce a net result of more acres managed for waterfowl in the Grand Prairie, and a greater net farm income to farmer/landowner participants.

The Tennessee Cooperative Extension Service currently operates such a service, which includes publishing of a "hunting land registry", in order to facilitate connecting the supply and demand sides of the hunting lease market in that state. They also provide technical assistance and advice to landowners regarding other aspects (liability, etc.) of leasing. A number of potential entities could help to provide this service as a part of the Advance Action Plan.

b. Incentives: This practice carries a direct financial incentive in the form of hunting lease income which can be a very significant supplement to agricultural income. Inasmuch as most landowners are aware of this potential, the type of general assistance outlined could be sufficient to attract much additional participation.

c. Potential Partners:

- o Farmers
- o White River Regional Irrigation Water Distribution District
- o Arkansas Cooperative Extension Service
- o Stuttgart (and other?) Chambers of Commerce

5. Habitat Restoration:

a. Component Outline: Through this practice, financial assistance would be available to farmers interested in habitat restoration, i.e., taking marginal land out of production and restoring natural vegetation. This would probably be the least used and smallest component of the Advanced Action Plan, but its inclusion in the overall Irrigation Project can be justified for a number of reasons, including: (1) the restoration of forest, prairie, and warm-season grasses on marginal agricultural lands could reduce the demand for irrigation water on relatively unproductive lands or those on which water cannot be managed efficiently; (2) water quality improvements

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would result; (3) restoration in certain locations, e.g., along watercourses, could affect water temperature in ways that would be beneficial for fish, and perhaps for cropping considerations; (4) sedimentation into watercourses could be reduced by selective restoration, thereby reducing future irrigation project maintenance costs; and, (5) restoration in some areas could reduce evaporative losses from the irrigation system.

b. Incentives: Like the other practices, participation would be completely voluntary to the landowner. However, for the relatively small acreages which farmers might currently be interested in restoring, a significant cost-share (up to 100% in cases) can already be provided. If the District would be interested in targeting specific areas at a future time, e.g., along watercourses, incentives sufficient to elicit the desired participation could be developed.

c. Potential Partners:

- o Farmers
- o U.S. Fish and Wildlife Service
- o Arkansas Game and Fish Commission
- o The Nature Conservancy
- o White River Regional Irrigation Water Distribution District
- o Natural Resources Conservation Service
- o Consolidated Farm Services Agency

VI. RELATED QUESTIONS FOR CONSIDERATION:

1. What can the Corps of Engineers contribute as a partner to any aspect of an Advanced Action Plan?
2. What other partners can be brought into the Plan?
3. What other potential components can be identified for discussion?
4. Can the existing partners work together to address issues of mutual concern which would benefit the Joint Venture Project, e.g., a change in the regulation of set-aside land management?
5. How can we work as many acres as possible into "long-term agreements" to ease administrative burdens?
6. Etc., etc., etc.

May 6, 1999

Colonel Daniel W. Krueger
Corps of Engineers-Memphis Division
167 North Main
Federal Office Building
Memphis TN 38103

WHITE RIVER



IRRIGATION DISTRICT

Dear Colonel Krueger,

I am writing to reaffirm our commitment to the waterfowl features as presented in the Grand Prairie Area Demonstration Project General Reevaluation Report. Waterfowl and waterfowl hunting have played, and will continue to play, a major role in the culture of the Grand Prairie. Our members are avid supporters of waterfowl conservation and realize the importance of the Grand Prairie, Bayou Meto and the entire Lower White River area to wintering waterfowl.

The members of the irrigation district have installed many measures without federal or state assistance, or the assistance of any private organizations, to enhance their land for waterfowl. Waterfowl needs are a factor most farmers consider in the operations of their farm. The District wishes to pursue the joint venture formulated by the multi-agency task force to help carry out our part of the North American Waterfowl Management Plan. We recognize that all the agencies represented in the draft agreement can pool resources to provide more comprehensive waterfowl enhancements than any group acting alone. I have enclosed a draft copy of the plan from March of 1995, for your review. We ask your assistance and expertise to bring the groups that participated in development of the waterfowl plan as part of the planning for the Grand Prairie Project back together to finalize and execute joint venture agreements. Regardless of the level of cooperation and commitment of other groups in a joint venture plan, the irrigation district will fulfill its commitments to operate and maintain the project's waterfowl features for the protection and enhancement of waterfowl, including the average annual rolling and flooding of at least 38,000 acres of rice fields.

Rice and ducks go hand in hand on the prairie. The high quality food sources provided in the rolled and flooded rice fields on the prairie have helped offset the losses of bottomland hardwoods outside the prairie. Without construction of the Grand Prairie Project, rice production will sharply decline as the aquifer dries and waterfowl will suffer. With the project, we have the opportunity to maintain rice production, restore historic native prairie grasses, restore fisheries in native streams and irrigation reservoirs, and roll and flood more rice fields for waterfowl.

The members of the irrigation district are very concerned for the Grand Prairie. Many of us were raised on the prairie and grew up with an appreciation of the areas' unique environmental resources. We want to ensure that our children and their children can gain this same appreciation. The irrigation district is committed to protecting and enhancing the environment and this project presents an outstanding opportunity for us, with the help of our partners, to meet that commitment.

Regards,

A handwritten signature in dark ink, appearing to read 'Tommy Hillman', written over a horizontal line.

Tommy Hillman,
President

TH/js

Enclosure

cc: Edward Lambert ✓



STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501) 682-0744
FAX: (501) 682-0910



September 22, 1998

Colonel Daniel W. Krueger, District Engineer
Memphis District Corps of Engineers
167 North Mid America Mall
B-202 Clifford Davis Federal Building
Memphis, Tennessee 38103-1894

RE: Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project - Draft General Reevaluation Report and Environmental Impact Statement

Dear Colonel Krueger:

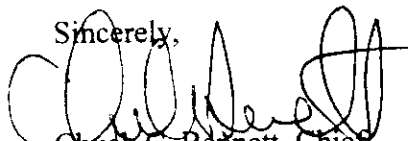
The Arkansas Department of Pollution Control and Ecology has completed its review of the above referenced GRR and EIS for the purpose of agricultural water supply, conservation, and groundwater protection in eastern Arkansas.

The Department has several concerns that need to be addressed before a decision relative to §401 water quality certification can be made. Specifically:

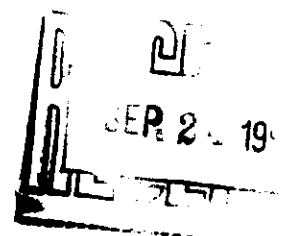
1. What is the minimum flow in cubic feet per second that will be used for the pump cut-off level? The GRR gave a range of flows based on mean monthly flows in the State Water Plan. The Department needs an actual minimum flow number.
2. How will sediment transport and scour be controlled in the 184 miles of earthen canals?
3. What will be the impacts on water quality from six years of construction?
4. How will maintenance be performed and who is responsible for maintenance?

The Department looks forward to working with the Corps of Engineers on the project.

Sincerely,


Chuck C. Bennett, Chief
Water Division

cc: Roger Hancock
J. Randy Young
Craig Uyeda





**DEPARTMENT OF
PARKS & TOURISM**

One Capitol Mall
Little Rock, AR 72201

Phone: 501-682-7777

FAX: 501-682-1364

History Commission
501-682-6900 (V/TT)

Personnel Section
501-682-7742 (V/TT)

State Parks Division
501-682-1191 (V/TT)

Tourism Division
501-682-7777 (V/TT)

Internet:

www.arkansas.com

**Mike Huckabee
GOVERNOR**

Richard W. Davies
EXECUTIVE DIRECTOR

**STATE PARKS,
RECREATION
& TRAVEL
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STATE PARKS

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TOURISM

Nancy Clark
GREAT RIVER ROAD

John L. Ferguson
HISTORY COMMISSION

**AN EQUAL
OPPORTUNITY/
AFFIRMATIVE ACTION/
AMERICANS WITH
DISABILITIES ACT
EMPLOYER**

Arkansas

THE NATURAL STATE

September 21, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

To Whom it May Concern:

In reference to the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project, Draft General Reevaluation Report (GRR) and Environmental Impact Statement, we appreciate the opportunity to comment.

We concur with the comments submitted by the Arkansas Game and Fish Commission in their letter of February 22, 1996, concerning the possible impacts on fish and wildlife resources and would also say that the public recreational possibilities for this project should be explored further. With the number of miles of canals that would be built, we would think there would be some opportunities for public access where these waterways crossed public lands, such as highway right-of-ways, for instance.

We were disappointed to see the comment in paragraph 1.13 of the Draft EIS summary that "recreational development is a low budgetary priority under current Corps policy." That comment is difficult to understand from the nation's leading provider of water based recreation and the nation's second leading provider of all recreation. Recreational benefits were used in the cost benefit analysis for this project, yet the Corps acts as if they have no responsibility for helping to manage it. This is especially disturbing in light to the language in Section 208(a) of the Water Resources Development Act of 1996, which directs the Corps to provide increased emphasis on, and opportunities for recreation at water resources projects operated, maintained or constructed by the Corps of Engineers.

If you have any questions, or need further information, please feel free to contact us. We hope these comments are helpful in the planning process.

Sincerely,

Richard W. Davies
Executive Director



Arkansas GEOLOGICAL COMMISSION
VARDELLE PARHAM GEOLOGY CENTER • 3815 WEST ROOSEVELT ROAD • LITTLE ROCK, ARKANSAS 72204

WILLIAM V. BUSH
STATE GEOLOGIST

September 3, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PH-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Commander:

Bill Prior, of my staff, reviewed the Grand Prairie Area Demonstration Project and provided me with the following comments:

The plan seems to be sound with a balanced approach for water conservation of the Alluvial Aquifer and use of the White River for much needed irrigation supplies.

One concern, however, is that there is no mention of any assessment of earthquake hazards in the design of the main pumpage station near DeValls Bluff, Arkansas in Volumes 1 and 9. The structure is to be located on the White River floodplain atop 20 feet of fill. Such a placement and construction could cause foundation failure during a major earthquake in the region. Also, earth levees and dikes built above the surrounding land level could fail, especially during periods of heavy rainfall.

If we can be of any further assistance, please call me.

Sincerely,

A handwritten signature in black ink, appearing to read "W. V. Bush".

William V. Bush



Arkansas Department of Health

4815 West Markham Street • Little Rock, Arkansas 72205-3867 • Telephone (501) 661-2000

Sandra B. Nichols, M.D., Director • Mike Huckabee, Governor

August 17, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

RE: Eastern Arkansas Region Comprehensive Study
Grand Prairie Area Demonstration Project
Draft General Reevaluation Report and Environmental Impact Statement

Commander:

We have reviewed volumes 1 and 9 of the above referenced report and while we concur in general with the report, we have the following comments:

1. The cities of Carlisle, Hazen, DeValls Bluff, Ulm, Stuttgart, and Dewitt have water and sewer mains in the project area. The city of Des Arc and the Grand Prairie Regional Water Distribution District have water mains in the project area.
2. Plans and specifications for the relocation of any water or sewer mains should be submitted to and approved by this office prior to commencement of construction.
3. Funding of this project will need to include monies for the relocation of water and/or sewer mains and services.

The report is being retained for our files. If you have any questions, we may be contacted at 501-661-2623.

Sincerely,

Robert Hart, P.E.
Chief Engineer
Division of Engineering

cc: Carlisle Waterworks
Hazen Waterworks
DeValls Bluff Waterworks
Ulm Waterworks
Des Arc Waterworks
Grand Prairie Regional Water Distribution District
Stuttgart Waterworks
DeWitt Waterworks

RH:CSC:RT:GAG:GT:csc

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WILDLIFE MANAGEMENT INSTITUTE

Chester A. McConnell, *Field Representative*

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ROLLIN D. SPARROWE
President

LONNIE L. WILLIAMSON
Vice-President

RICHARD E. McCABE
Secretary

September 21, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVN-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Commander:

The Wildlife Management Institute has reviewed the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project Draft General Reevaluation Report (GRR), Draft Environmental Impact Statement (DEIS) and Appendix C-Environmental report. We appreciate the opportunity to provide our comments on the several documents which explain project plans and impacts.

The proposed Grand Prairie Area Demonstration Project (GPADP) was authorized by the Water Resources Development Act of 1996 as a **multiple purpose project to provide agricultural water supply and conservation, groundwater protection and waterfowl conservation benefits**. The GPADP project area includes a total of 362,662 acres, of which 247,556 acres is cropland. A majority of the landowners in the project area south of DeWitt, AR petitioned to be excluded from the WRRIWDD and this resulted in a reduction of the water needed for irrigation. Four alternative plans were considered in detail with Alternative 7B being chosen as the tentatively selected plan. Alternative 7B includes a water import system to divert approximately 243,900 acre-feet of water per year from the White River through a 1,640 cubic feet per second pumping plant. The water will be used to irrigate cropland. A system of new canals (184 miles), pipelines (177 miles), existing channels (291 miles), and associated structures [weirs (120), diversion structures (165), inverted siphons (28) and lift stations] would be used to transfer water to 8,949 acres of new on-farm irrigation reservoirs and tail-water recovery systems.

Although the GPADP is the only currently authorized project, it is only one of five irrigation projects proposed as part of the overall Eastern Arkansas Comprehensive Project. Two other irrigation projects being considered would withdraw water from the White River, one would

withdraw water from Bayou Meto and one would withdraw water from the Little Red River. We urge the Corps to include an assessment of the potential cumulative impacts of all irrigation projects being considered in the Eastern Arkansas Region Comprehensive Study in the Final EIS. Due, in part, to a long list of government and private water related projects in eastern Arkansas, some tremendous problems have developed. This creates a serious need to study cumulative effects of all proposed projects involving water resources. Such studies may aid in preventing some additional serious, long-term problems.

On page 5 of the GRR it is claimed that "this document is of sufficient detail and content to serve as a basis for proceeding to design memoranda, as needed, and plans and specifications for project construction." We disagree with this statement and will identify some of our major concerns. Our review concludes that both the GRR and DEIS are incomplete and inadequate according to requirements of the National Environmental Policy Act. These documents indicate that many major project decisions concerning development, operation and maintenance agreements between the Corps of Engineers, Natural Resources Conservation Service and the White River Regional Irrigation Water Distribution District (WRRIWDD) (non-federal sponsor) have not been made. We will identify some of the indecisive situations in this letter. Because of the absence of some important specific details and/or the lack of disclosure of important features of the plan, we were not able to arrive at fully informed conclusions on all elements of interests to us.

Of particular interest to us is project related impacts on wildlife and fish in the GPADP. Unfortunately, with the exception of fish, the documents included few specifics about such impacts. We recognize that this results partially from the widespread intensive agricultural landuse of the project area. However, the documents included many claims for project induced benefits to waterfowl and waterfowl hunting. Yet we could locate no specific plans for waterfowl and we understand that none exist.

Our specific comments are provided for each report as follows:

Draft General Reevaluation Report (GRR)

Page 19. Meteorology. The average annual rainfall for the project area is described as approximately 49 inches with the distribution by months listed. It is claimed that "This distribution does not correlate to the timing of water needs for agriculture." This is an incorrect statement and should be excluded. Numerous farms are successful in the project vicinity with this amount of rainfall and distribution. Certainly farming in the area may be more productive with irrigation water, however this also comes at high economic and environmental costs.

Page 21. Fisheries. The White River is identified here, and in other sections of the project documents, as having high quality fisheries. According to the GRR, 243,900 acre-feet of water per year will be pumped from White River to irrigate crops during the growing season. To benefit waterfowl, the documents claim that water would be pumped in the fall/winter season from the

White River onto 38,525 acres at an average depth of 4 inches beginning in October. The proposed pumping would follow the driest period of the year (July, August, September and October - page 19, GRR). What effect will this have on the White River fishery during the lowest flow of the year during years of low rainfall? What effect will pesticides used on agricultural lands have when irrigation runoff reenters streams, especially during low stream flow periods? What effect may this have on White River National Wildlife Refuge and other public lands located downstream of the project area? The GRR (on page 21) explains that desiccation during summer has an adverse effect on fisheries in tributary streams. Other studies referenced in the documents claim that the water removal from the White River will not have a significant adverse effect on the fishery. The tremendously valuable sport and commercial fishery of the White River deserves exceptional protection.

Page 45. Flooding For Waterfowl. This section identifies a major need for additional waterfowl feeding and resting areas in eastern Arkansas. A claim is made that a waterfowl habitat plan was developed by a coalition of agencies and private interests. The stated goal of the plan "was to annually flood 45,000 acres of harvested fields and annually manage up to 30,000 additional acres to impound rain water." Required flooding depths were estimated to be "an average of 4 inches." According to the GRR, a "joint venture" project to accomplish these goals was developed under auspices of the North American Waterfowl Management (NAWMP). This claim was repeated on page 77 for the selected plan (Alternative 7B). Here it is claimed that 38,529 acres of harvested rice fields would be flooded on an average annual basis from 1 November to 28 February to provide 22,385,349 duck-use days annually.

After thorough review of all GPAPD project documents, we could not locate a waterfowl plan of any kind for the specific project area. I serve on the NAWMP Lower Mississippi River Joint Venture Board and I do not recall ever learning about a NAWMP joint venture project for the GPAPD. We contacted your office, the Fish and Wildlife Service and the Arkansas Game and Fish Commission to inquire about a specific waterfowl plan for the GPAPD. We were advised that, indeed, no specific waterfowl plan or NAWMP "joint venture" project has been developed for the GPAPD area. We urge that either a specific waterfowl plan be developed or that all references to such a plan be removed from all project related documents.

Page 87. Table 10. This table identifies annual waterfowl benefits of \$473,000. This sum was used to arrive at the project benefit-to-cost ratio. Assuming that there is no waterfowl plan, how was this sum developed?

Page 88 and Table 11. The text on this page and table 11 states that "38,525 acres of cropland will be annually flooded to benefit waterfowl" as one of the measured effects of the plan. Again there is no specific plan or other information that we can locate which will allow anyone reviewing the GRR, DEIS or Appendix C-Environmental document to understand this claim. For example, specifically where are the private land acres that will be flooded? How much will the pumped water cost? Who will pay for the cost of the pumped water? Who will pay landowners to repair the many miles of rice field levees so that they will hold water on the fields? Have sufficient

numbers of private landowners agreed to allow for 38,525 acres to be flooded from 1 November to 28 February? What types of agreements will be made with private landowners for flooding rights on their fields? If a plan with these specifics or any specifics concerning wildlife exist for the proposed GPADP project area, please furnish us a copy for review. Also, please include any such plans as an integral part of the final GRR and EIS.

Pages 85 and 100. It is explained on pages 85 and 100 that Section 103(j)(1) of the Water Resources Development Act of 1986 mandates that "Any project to which this section applies (other than a project for hydroelectric power) shall be initiated only after non-Federal interests have entered into binding agreements with the Secretary to pay 100 percent of the operation, maintenance, and replacement and rehabilitation costs of the projects . . ." Have the non-Federal interests agreed to pay for the total costs of the entire project, including the operation and maintenance of reconstructed rice field levees and pumping water to flood 38,525 acres to an average depth of 4 inches from 1 November through February 28 for waterfowl habitat? If so, please include specific information of such agreements in the final GRR and EIS.

Page 102. It is further explained on page 102 that:

"At this stage of project development, it was **assumed** that there would an agreement with the Natural Resources Conservation Service (NRCS) to implement on-farm features. This includes all conservation measures, management strategies, and retrofit of existing irrigation systems to utilize the delivery system. This component also includes provisions for **providing waterfowl feeding and resting areas during the fall and winter months**. As the project further develops, implementation and operation and maintenance of on-farm features may follow a different approach" (emphasis ours).

We assume that this refers to the 38,525 acres to be flooded for waterfowl habitat. If we are correct, has NRCS developed plans for the on-farm features? If so, please furnish us copies of the agreements and plans. Importantly, these should be included in the final GRR and EIS. The text on page 102 indicates that there may be confusion concerning responsibilities and authorities.

Likewise, a letter dated June 12, 1988 to Colonel Bean from Tommy Hillman (WRRJWDD) and included in the GRR (inserted following page 110) indicates more confusion of responsibilities. This letter states, in part, that:

"...before we can finalize the details of our Financing Plan and enter into Project Cooperation Agreement (PCA), many issues involving Federal participation in the project must be resolved. The most significant issues concern the extent of Federal participation in individual project features such as the on-farm component of the project and the development of appropriate ability to pay cost share guidelines as provided by current Federal law. Until these crucial issues, which directly affect the non-Federal share, are resolved it is impossible to produce a detailed Financing Plan."

Because these “on-farm components” and federal-state-local financial responsibilities are an essential part of the plan, we contend that these should be completed and circulated to all interested reviewers for comments prior to completion of the draft GRR and DEIS.

Draft Environmental Impact Statement

EIS-2 and 3. It is explained here that one of the reasons for selecting Alternative 7B as the tentative selected plan is that it “provided additional waterfowl habitat.” We repeat our previous concerns that we can locate no specific waterfowl plan for the GPADP, or any official who knows that such a plan exist. Because there appears to be no specific waterfowl plan, as claimed, we submit that the DEIS is incomplete and not adequate in accordance with the National Environmental Policy Act.

EIS-4, 1.13. It is explained here that the Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service have expressed concerns that the project, as designed, would not provide sufficient recreational opportunities to the general public. The Wildlife Management Institute supports these concerns. Because the project is projected to cost taxpayers \$271 million, and because the irrigation water to be pumped from the White River is a public resource that is intended to be used by private landowners, we contend that an equitable amount of land should be open to the public for hunting, fishing, birding and other forms of compatible outdoor recreation. Such lands should be specifically identified and agreements made for their use before final legal agreements are completed between the Corps, NRCS and WRRIWDD that would allow the proposed project to begin. Because of the emphasis on waterfowl management, waterfowl hunting and fishing in the project documents, we were surprised to read on page EIS-5 that “recreational development is a low budgetary priority under current Corps policy.”

EIS-12. Without Condition. Was it considered in this alternative that many landowners could convert from water intensive rice farming to other crops such as soybeans and corn that need much less water? The information in the GRR and DEIS was not sufficient for us to know if this was considered. Currently, more than 60 percent of the farmers in the project area farm soybeans, corn and grain sorghum which require less water. The tremendous amount of water used for rice crops have created the ground water shortage and the need for stream water for irrigation. Strict water conservation and conversion to crops which require less water could help reduce dependence on large volumes of water. Meters could be placed at appropriate locations to help enforce water conservation. We believe an alternative should be considered that requires less water for the DEIS to be considerate adequate in accordance with the National Environmental Policy Act.

EIS-12. Plans considered. Please include in the final EIS a brief explanation of why the majority of landowners in the southeastern section of the original project area opted not to participate in the project.

EIS-15, 4.17. Management for waterfowl on project area cropland is again claimed here as being

under auspices of the North American Waterfowl Plan. Please review our previous statements concerning this matter. Someone may have voiced such a need, but we cannot locate such a plan. In any case, voicing needs does not translate into on the ground realities in the Grand Prairie Area project.

EIS-25 and EIS-71. Wildlife. A stated impact of Alternative 7B, the tentively selected plan, is "flooding 38,529 acres of harvested rice fields would provide an additional 12,275,949 duck-use-days per year." See our previous statements concerning this claim and include specific plans, if available, in the final project documents. If there are no specific plans, then beneficial project impacts would be much less for waterfowl.

EIS-27. Recreation. It is stated here that Alternative 7B "would annually provide 28,769 man-days of waterfowl hunting and \$860,760 in related expenditures." See our previous comments and please specify what specific wildlife planning document includes this information.

This proposed GPADP project is certainly a reversal in purpose when compared to other Corps of Engineers and Natural Resource Conservation Service (NRCS) projects. For the past fifty years the Corps and NRCS have developed numerous projects designed to remove or hold water off croplands. Many thousands of miles of streams have been channelized by both agencies to drain wetlands and to reduce flooding on agricultural lands. Specifically within the Eastern Arkansas Region Comprehensive Study area, hundreds of miles of streams have been channelized and ditches dug to drain wetlands and eliminate water from the land surface. Without a doubt these projects have contributed to the reduction of aquifer recharge. Now, the agencies have come full circle and are proposing to pump water from streams to irrigate fields because of serious declines in aquifer water resources. Indeed, this is an unbelievable turn of events.

The Wildlife Management Institute believes that a project could be designed that would better serve the long-term interest of our nation. Such a project would include conversion to agricultural crops that require less water than rice, conservation of water resources, conservation tillage and rice acreage in balance with aquifer recharge.

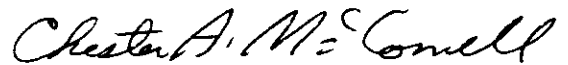
We also believe strongly that no taxpayer-funded project to help solve the situation described in the GRR should be approved without a specific wildlife component. Provisions explained in the GRR and DEIS to flood 38,529 acres of harvested rice fields on an average annual basis from 1 November to 28 February to provide 22,385,349 duck-use days annually should be the minimum component considered. Some of these acres should be made available for public use for hunting, fishing, birding and other outdoor recreational needs. Some of the acres should be established as waterfowl resting areas with no hunting allowed.

We urge that specific plans to accomplish the wildlife component be developed and agreed to by the Corps of Engineers, NRCS, WRRIWDD, U.S. Fish and Wildlife Service and the Arkansas Game and Fish Commission prior to completion of the GPADP plan. The wildlife plan should include the specific acres to be included, water management agreement for fields to be

flooded, hunting agreements, acres for waterfowl resting, agreements for specific landowners to restore rice field levees to hold water on fields from November 1 through February and signed legal agreements with all specific landowners involved in the plan. All of the wildlife component agreements should be made prior to completion of GPADP project plans and should be required to be implemented on the same schedule as any water import project components are implemented.

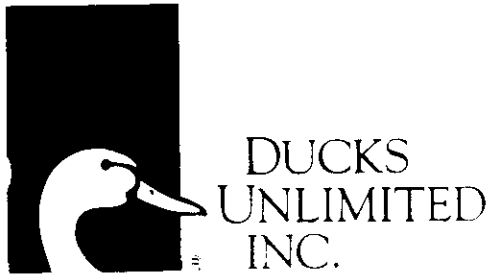
We appreciate the opportunity to provide our comments. Should you have questions about our views, please contact us.

Sincerely,

A handwritten signature in cursive script that reads "Chester A. McConnell".

Chester A. McConnell
Southeast Representative
Wildlife Management Institute
110 Wildwoods Lane
Lawrenceburg, TN, 38464

Telephone (615) 762-7718



DUCKS UNLIMITED
SOUTHERN REGIONAL OFFICE

193 Business Park Drive, Suite E
Ridgeland, Mississippi 39157
(601) 956-1936 Office
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September 24, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Commander:

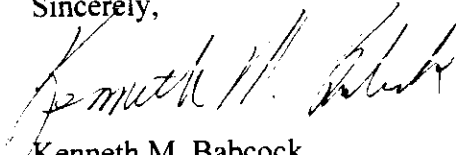
Thank you for requesting Ducks Unlimited's review of the Draft General Reevaluation Report and Environmental Impact Statement for the Grand Prairie Area Demonstration Project of the Eastern Arkansas Region Comprehensive Study. Because of the importance of the Grand Prairie and White River to waterfowl and other wildlife, we are concerned about resource issues and projects that affect wetlands. We appreciate the opportunity to provide input.

The project will affect a portion of the White River designated as a RAMSAR Wetland of International Importance. This designation is reserved for wetlands meeting certain environmental criteria making them truly worthy of international recognition. Designation also is intended to limit unnecessary alteration. We understand the need for water on the Grand Prairie for crop irrigation and appreciate that withdrawals will be timed to minimize impacts to White River flows. Nonetheless, we caution that this project constitutes an alteration to an internationally recognized wetland system. We also offer concern about the cumulative effects of this and other projects including the dams on the upper White River, the new Montgomery Point Lock and Dam, other irrigation projects planned upstream of the Grand Prairie project, and the potential White River Navigation Project. We urge caution and encourage you to coordinate very closely with state and other federal conservation agencies and the public as you plan these projects. We are confident that you will make efforts to avoid and minimize negative impacts to this important wetland system.

Ducks Unlimited has extensive experience in wetland development, moist-soil management and reforestation of bottomland hardwood wetlands. We offer our biological and engineering assistance as required as planning continues. Please contact Jon Schneider, DU Regional Biologist in Stuttgart (870/673-8781), if we can provide and additional information or assistance.

Again, we appreciate your request for input from Ducks Unlimited, and we look forward to future opportunities to work with you to conserve wetlands and waterfowl habitat in the region.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth M. Babcock". The signature is written in a cursive, flowing style.

Kenneth M. Babcock
Director of Operations

KB:kw

cc: Dr. Alan Wentz, Group Manager of Conservation -- DU
Mr. Steve Wilson, Director -- Arkansas Game and Fish Commission
Mr. Sam Hamilton, Regional Director -- U.S. Fish & Wildlife Service, Region 4 (SE)
Mr. Billy Joe Cross, Director of Field Operations -- DU

ROSE LAW FIRM

A PROFESSIONAL ASSOCIATION

ATTORNEYS

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72201-2893

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WRITER'S ELECTRONIC MAIL
broenthal@roselawfirm.com

October 5, 1998

VIA TELECOPY & VIA FEDERAL EXPRESS

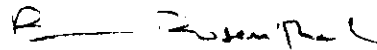
Commander
United States Army Corps of
Engineers, Memphis District
ATTN: CEMVM-PD-R
167 North Main B-202
Memphis, Tennessee 38103-1894

Re: Eastern Arkansas Region Comprehensive
Study, Grand Prairie Demonstration
Project, Draft General Evaluation Report
("Draft Report") and Draft Environmental
Impact Statement ("DEIS")

Dear Commander:

Enclosed please find Bunge Corporation's Comments to Draft Grand
Prairie Region and Bayou Meto Basin, Arkansas Project, Grand Prairie Area
Demonstration Project and to draft Environmental Impact Statement.

Sincerely yours,



Brian Rosenthal

j1
Enclosure
c w/encl.:
Ed Lambert (via telecopy)
Murray Warschauer
Fred Luckey
Kaneaster Hodges

**BUNGE CORPORATION'S COMMENTS
TO DRAFT GRAND PRAIRIE REGION AND BAYOU METO BASIN,
ARKANSAS PROJECT, GRAND PRAIRIE AREA DEMONSTRATION PROJECT
GENERAL REEVALUATION REPORT
AND TO DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Bunge Corporation ("Bunge") submits these comments in response to the Draft Grand Prairie Region and Bayou Meto Basin, Arkansas Project, Grand Prairie Area Demonstration Project (the "Project") General Reevaluation Report ("Draft Report") and in response to the Draft Environmental Impact Statement ("DEIS"). As mentioned in the Draft Report, Bunge is the largest commercial navigator on the White River.

Bunge requested an extension of the comment period for 120 days. A copy of the request is attached as Exhibit A. A 15-day extension was granted. A copy of the extension letter is attached as Exhibit B.

Initially, Bunge wishes to make clear that it has never taken a position on the Project. Because Bunge and its customers have a significant investment in the continued navigability of the White River, Bunge is commenting on the Project Draft Report and DEIS. Any decrease in available river use will add to the cost of doing business and take dollars from the pockets of farmers in the White River Basin.

I. Introduction

Bunge is an integrated food and agribusiness company headquartered in St. Louis, Missouri. As part of its operations, Bunge buys wheat, corn, soybeans and sorghum from farmers and grain dealers in the Midwest and Midsouth. Bunge stores, transports, processes and exports grain and grain products. Its operations cover a network of grain elevators, located primarily along the Mississippi River and its tributaries, including the White River.

Specific to the issue of navigation on the White River, Bunge operates seven elevators on the White River with an aggregate storage capacity of well over 18,000,000 bushels. These stations are located at Newport, Augusta (3), Des Arc, Clarendon and St. Charles, Arkansas. The stations serve over 1500 farmer and dealer customers and represent a significant investment by Bunge in Arkansas' White River Basin.

The fundamental premise underlying the Project is that there is adequate excess water in the White River to support such a Project. Under Arkansas law, before any excess water is available,

however, instream flows for navigation (among other uses) must be maintained.¹

Thus, the fact that navigation would not be harmed by the Project has been a fundamental Project premise. Assurances regarding the fact that navigation would not be negatively affected by the Project have been made to Bunge and to Arkansas' congressional delegation.

The Draft Report now concludes that the negative effect on navigation may be as much as a one foot or more decline in the White River.² Also, pursuant to the Draft Report, in periods of delay, light loading or alternative transport, the affected farmers will suffer a decrease of from 5-15% in income.³ Such amounts are not only negative effects, but are also significant negative effects.

Ironically, as noted hereinafter, the Corps, whose primary mission historically has been navigation, has insufficiently analyzed the Project's navigational effects. Even as analyzed, a significant negative effect is projected.

II. Comments on Navigation

Comments on a Draft Report and DEIS are appropriate to assist in focusing on gaps of information or analysis. Such gaps exist in the Draft Report and DEIS. Bunge's comments are as follows:

Comment 1. The fundamental Project assumption is that the White River has sufficient excess water. The Draft Report is based on the Arkansas State Water Plan (sometimes referenced herein as "ASWP"), completed in 1986, and reflects water flow data from 1940-1986. While the Draft Report acknowledges that more recent water data exists, the Draft Report's conclusions are not based on the more recent data, but are based on the 1986 Arkansas State Water Plan and dated water flow data.⁴

The governing DEIS regulations note that accurate scientific analysis is "essential to implementing [the National Environmental Policy Act]." "Most important, NEPA documents must concentrate on

¹ Ark. Code Ann. § 15-22-304(b)(4). In addition, excess surface water is limited to 25% of the amount that is over the minimum needs.

² Draft Report IV-22.

³ Under the Federal Agriculture Improvements and Reform Act of 1996, continued emphasis will be placed by farmers on grains and grain products.

⁴ Draft Report, Volume IV-19.

the issues that are truly significant" ⁵ The DEIS's failure to analyze current data is unexplained and unexplainable. Such data, is now available, and must be included. ⁵

The Draft Report's construction schedule provides that Phase 1 of the Project is the pumping station. ⁷ Under governing law, water may be pumped out of the river only if there is an excess and if navigational needs are met. Current data regarding water flow data is unreviewed by the Corps. In addition, no state permit for a water transfer has been issued.

Also, as noted in Comment 3, in order to assess and project the potential damage to navigation, all parties must know the level at which pumping will cease. The Corps states the cutoff levels are the ASWP minimum streamflow levels. It is unclear, however, how these levels will be enforced and monitored. Allocation plan levels for the White River have yet to be finalized by the State of Arkansas. How will the Corps ensure ASWP cutoff levels are mandated, followed and enforced?

The White River has become a large source of aquifer replenishment, reversing historical trends. ⁸ No analysis is done regarding whether the tremendous current aquifer replenishment demands on the White River (on average) in recent years have affected the amount of any excess White River water. In addition, no analysis is included regarding how current recharge to the White River will be affected by reduced flows.

⁵ 40 CFR § 1500.1(b).

⁶ 40 CFR § 1502.22(a); 32 CFR § 651.32(k); Environmental Defense Fund v. Costle, 439 F.Supp. 980 (E.D.N.Y. 1977).

⁷ Volume I, p. 90.

⁸ The ASWCC's 1996 Staff Report on Allocation of the White River estimates that the area of the alluvial aquifer receiving recharge from the White River is about three million acres. Staff Report on Allocation of the White River, p. 46, August 1996. On average, approximately 167,000,000 gallons per day flow from the White River to aquifers. Analysis of Todd Fuggitt, Arkansas Soil and Water Conservation Commission ("ASWCC") Groundwater Division Chief, informational public meeting on Critical Ground Water Designation, Stuttgart, Arkansas, March 2, 1998;

See also Administrative Hearing Officer's Proposed Findings of Fact and Conclusions of Law and Proposed Commission Order, Before the Arkansas Soil and Water Conservation Commission, In Re: The Designation of the Alluvial and Sparta Aquifer Within Arkansas, Jefferson, and Prairie Counties, and Parts of Lonoke, Pulaski, and White Counties as a Critical Ground Water Area, No. CGWA 1998-2 p. 3; and Public Hearing Testimony, Critical Ground Water Area Designation, Stuttgart, April 20, 1998, p. 15.

In sum, the current availability of White River water to support the Project is unknown. Analysis is premature for a pumping station where there is no authority to pump. Such an advanced schedule is inconsistent with the many important Project requirements still left to be reviewed and predates the permit and allocation plan required under Arkansas law, but currently nonexistent.⁹

Comment 2. In 1995, Arkansas law was modified, further restricting the transfer of excess surface water in the White River Basin.¹⁰ While the White River was intended to be a beneficiary of this 1995 legislation limiting the amount of monthly withdrawals, no analysis is given in the Draft Report regarding the effect of this 1995 legislation on the 1986 Arkansas State Water Plan or on current conditions.

Comment 3. The DEIS includes detailed analyses only under pump cutoff levels set at the 1986 Arkansas State Water Plan minimum levels.¹¹ Similarly, the DEIS includes only monetary effects based on ASWP pump cutoff levels.

Unless assurances are provided that the cutoff levels of the Arkansas State Water Plan will be enforced by the Corps, the White River Regional Irrigation Water Distribution District ("Irrigation District") and the Arkansas Soil and Water Conservation Commission ("ASWCC"), there is a grave potential for possible conflict.¹² An example of such a federal/state conflict is evidenced by the ASWCC's Draft Allocation Plan, which could be interpreted to allow pumping under a worst case scenario to levels far lower than under the Corps' ASWP levels.¹³

In meetings with Corps' representatives on September 24, 1998, Bunge was advised and assured that the ASWP would provide the mandated, operative pump cutoff criteria as part of the governing Project Cooperation Agreement ("PCA"). (See Comment 9). Such assurance was made because the Project reevaluation is based on the ASWP; the ASWP is the plan presented to Congress for funding; and the DEIS is based on the ASWP.

⁹ Draft Operations Manual, Vol. 4.

¹⁰ Such transfers shall not exceed on a monthly basis an amount which is fifty percent (50%) of the monthly average of each individual month. Ark. Code Ann. § 15-22-304(e).

¹¹ DEIS § 4.8, p. 13.

¹² 40 CFR § 1502.16(c).

¹³ For example, under the Corps' review, the minimum streamflow level for June is 21,220 cfs. Under the state's Draft Allocation Plan, the level is 7,125 cfs.

It is unclear how the Corps intends to bind the Irrigation District and ASWCC to the ASWP pursuant to a PCA. Unless this issue is resolved, one is unable to assess the potential impact on navigation under the Corps' proposal. Such an evaluation is impossible.

For instance, some of the questions presented are as follows:

(a) If the Corps' plan is under the 1986 ASWP, how will the ASWP minimum streamflow levels be required?

(b) What entity will monitor compliance?

(c) How will compliance be enforced?

(d) What court will have jurisdiction over compliance?

(e) How will the Corps involvement and monitoring change when control of the Project is turned over to the Irrigation District?

(f) What law governs if the ASWCC sets a worst case lower level for diversion shutoff under its allocation plan?

(g) If the answer to any of these questions is that the Project Cooperation Agreement ("PCA") will control, what are the standards for entering, monitoring and enforcing a PCA under such conditions (See Comment 9)?

(h) Will navigation interests be allowed to execute the PCA or a subagreement or otherwise be acknowledged as a third party beneficiary with the ability to rely on and enforce the PCA or subagreement?

Thus, the Corps should include an explanation of how the ASWP will be the governing, operating constraint.¹⁴

Comment 4. No mechanism, such as monitoring, is in place to ensure compliance with the Draft Report.¹⁵ Such monitoring is required in controversial cases and should include conditions in approvals and requirements for reporting results.¹⁶ Here the DEIS acknowledges that navigation effects are one of the three areas of controversy.¹⁷ No provision is made, however, regarding the result if navigation is affected in an unplanned way. In addition, no analysis is done regarding experiences with other water irrigation

¹⁴ Response to Comment 2 is unclear on this point (DEIS - 94).

¹⁵ 32 CFR § 651.32(m).

¹⁶ Id.

¹⁷ DEIS p. 4.

projects in other states, regarding reductions in river stages and effects on navigation, sedimentation and siltation.

Without monitoring and other protections, if projections are inaccurate, there could be irreversible commitments of the White River's resources.¹⁸ The DEIS should include mitigating protections in the event of unforeseen reductions in river stages.¹⁹ Such protections, at a minimum, should be that the Project will be reevaluated if the projections prove materially inaccurate.²⁰

Comment 5. While Bunge is correctly noted as the major transporter on the White River, Bunge has been unable to interpret the Corps' data regarding moved tonnage. The Corps' tonnage information is contrary to Bunge's shipping information. While the Draft Report reflects 544,000 tons shipped in 1996, Bunge's records alone reflect 655,000 tons shipped.²¹ Therefore, without considering any other shipper, the Corps' data understates actual tonnage shipped by at least 20%.

Comment 6. Bunge notes the Project operating plan prioritizes pipeline usage or water pumped from the White River over reservoir usage. The Draft Report contains an inadequate review of alternatives regarding use of stored water versus use of pipeline water. By prioritizing pumping from the river, additional analysis is needed regarding any environmental consequences, such as to recharge or such as from sedimentation and siltation because of increased maintenance needs.

Also, requirements for mandating conservation or promoting voluntary conservation measures should be included.²² This review is especially important because under Arkansas law, conservation can only be required if the area is designated "critical," and

¹⁸ 40 CFR § 1502.16; 42 U.S.C. § 4332(2)(c).

¹⁹ 40 CFR § 1502.16(h); 32 CFR § 651.32(1), (m).

²⁰ In addition, parameters for measuring such a material inaccuracy should be defined to prevent differences of opinion.

²¹ Draft Report D-II-39; D-III-44; DEIS § 5.77 p. 57. The increased amount is similar to Bunge's records for 1994, previously provided to ASWCC in a position paper dated April 7, 1994.

Bunge was advised at its September 24, 1998 Corps meeting, that the 544,000 tons figure actually represents average tonnage over a period of years. Aside from the question of the relevancy of a historical "average," we are unable to determine how the average was calculated.

²² The alternative section is the heart of the EIS submittal (40 CFR § 1502.14).

there are current legal challenges to such a designation in this area.

Such a detailed review of alternatives is consistent with NEPA policy and mandates. The NEPA process is to be used to identify and assess reasonable alternatives.²³ All practicable means are to be used to avoid or minimize effects on the environment.²⁴

Comment 7. The Draft Report concludes that navigation impacts will not exceed approximately a one foot decrease at any given time of the year. This assumption is based on pump cutoff levels set at the ASWP minimum. Under the Draft Report, it is not possible to ascertain how such levels will be monitored and enforced.

Even the projected, minimum one-foot decline can have significant, negative impacts on navigation. Such a one-foot decline also can have subtle impacts on navigation, including regarding the Corps' obligation or willingness to perform maintenance and dredging. Therefore, any change at the Clarendon gauge that has a direct impact on maintenance, indirectly affects navigation.²⁵ Bunge was advised at the September 24, 1998 Corps meeting that the Project will not affect current Corps maintenance practices, notwithstanding the projected, one-foot decline. Such commitment should be incorporated into the Draft Report and PCA.

Recall, the one foot projected drop is based on pump cutoff levels tied to the ASWP. The ASWCC Draft Allocation Plan, however, places the worst case diversion cutoff level at 7,125 cfs at Clarendon for so-called "summer" months of June-November. Such a level would halt navigation. Bunge has utilized the White River during these "summer" months for many years. Bunge's shipping records reflect the following:

²³ 40 CFR § 1500.2(e).

²⁴ 40 CFR § 1500.2(f).

²⁵ Volume IV, p. 19.

SHORT TONS

	June	July	August	September	October	November
1990	63,500	12,500	12,300	5,800	10,500	3,000
1991	13,100	37,200	----	----	----	33,400
1992	95,800	72,200	7,900	----	----	4,500
1993	59,500	44,900	1,600	----	9,400	63,000
1994	58,200	17,300	13,400	4,700	12,000	29,200
1995	44,300	42,200	34,100	1,600	----	6,100
1996	115,000	40,000	9,000	----	1,500	83,000

As can be seen, June and July are heavy navigational agricultural shipping months. They are the primary shipping months for soft red winter wheat and old crop soybeans. Both the wheat and the soybeans are major Arkansas crops. In addition, November also is a heavy navigational agricultural shipping month, with new crops (soybeans, corn, milo and rice) having just been harvested. Therefore, the importance of the ASWP as part of the Corps' proposal is additionally highlighted.

Comment 8. As noted by several of the other commentors, the governing regulations require that the DEIS be based on cumulative impacts. There are several irrigation projects proposed as part of the overall eastern Arkansas comprehensive project. Some of these projects would also draw water from the White River. It is critically important that a comprehensive study be made of cumulative effects of all proposed projects on the area's water resources.

Comment 9. The Department of the Army, Corps of Engineers, Engineering Circular No. 1165-2-204 (July 31, 1997) addresses PCA elements for authorized projects proceeding in separable elements. Under the Circular, the PCA must be based on the Draft Report²⁶. Such Draft Report must address the requirements for operation²⁷; must address any unusual technical or policy aspects of the project or element²⁸; and must identify project cooperation requirements.²⁹ "[T]he Project Manager is responsible for insuring that the draft PCA is tailored to any unique aspects of the project authorization and the decision document and to reflect any special

²⁶ Circular Section 7.(a).

²⁷ Circular Section 7.c.(1).

²⁸ Circular Section 7.c.(4).

²⁹ Circular Section 7.c.(8).

requirements of the sponsor that do not conflict with applicable law and Army policy."³⁰

"PCA provisions unique to the project or separable element should be simple and direct, since the decision document provides the necessary details."³¹ Subagreements may be entered with third parties to enable the sponsor to meet its legal obligations.³²

On September 24, 1998, Corps representatives acknowledged that the PCA would require the sponsor (Irrigation District) to comply with the Draft Report and the DEIS. Therefore, under the Draft Report and DEIS, the 1986 ASWP would be the controlling parameter. As noted hereinbefore, Bunge asks that the Corps confirm its intentions and advise what specific language will be added to the PCA to address operational issues, including monitoring. Pursuant to the Circular's guidance, such simple and direct language could be as follows:

The Irrigation District (sponsor) acknowledges that notwithstanding any other state law or agency rule passed by the Arkansas Soil and Water Conservation Commission or any other state agency, the Project is only authorized to operate at pump cutoff levels set at the 1986 ASWP. The sponsor shall enter into a subagreement with the Arkansas Soil and Water Conservation Commission ("ASWCC") (the entity that may authorize a water transfer permit), with both parties committing to abide by the 1986 ASWP. The subagreement will establish an objective method of monitoring and enforcing compliance. Parties whose rights and interests are affected by sustained river flows shall be deemed third party beneficiaries of such subagreement, with the ability to enforce the subagreement in federal court.

III. Conclusions

In summary, the Draft Report's and DEIS' analysis of navigation impacts is based on outdated data. The conclusions are based on pump cutoff levels that are much higher than current state diversion shutoff, allocation proposals. Each factor weighs in favor of the Project and against navigation.

In addition, inadequate review time was given commercial navigational interests, none of which were included in the

³⁰ Circular Section 8.b.; Circular Appendix C, 4.d.

³¹ Circular Section 9.d.

³² Circular Appendix B, Table 2, No. 8; Circular Appendix C, 4.c.

distribution list of the DEIS. A 120 day extension period was requested. The Corps granted an extension period of only 15 days.

The scant attention paid to navigation is contrary to the Corps' primary mission. The Project's goals, however, do not include protecting or maintaining navigational interests. The Project's objectives are to provide water supply and maximize outputs.³³

For all these reasons, the DEIS and Draft Report should be supplemented, because there is significant, relevant, current information bearing on the impact of the Project that remains unaddressed.³⁴ The Corps has not rigorously explored and objectively evaluated all reasonable alternatives, such as a preference for reservoir usage over pumping from the River.³⁵ In short, without sufficient analysis of current flow data, the Corps has not sufficiently analyzed the potential irrevocable commitment of White River resources.³⁶

If the Draft Report is adopted, the Corps must be very direct and explicit in its analysis of how cutoff levels tied to the ASWP will be required, monitored and not subject to change. Sample language is included under Comment 9. Also, the Corps' maintenance intentions should be clearly addressed.

Finally, Bunge is in the process of considering retaining one or more independent experts of national stature to review the navigation flow issues. This is being done so that effects relative to the White River and navigation can be thoroughly analyzed, including hydrology, groundwater and surface water. By filing these comments, Bunge reiterates its extension request made in its September 16th letter, copy attached as Exhibit A. Bunge anticipates the Corps will give due consideration to any such information.

³³ DEIS p. 11.

³⁴ 40 CFR § 1502.9(c)(1)(ii).

³⁵ 40 CFR § 1502.14(a).

³⁶ 42 U.S.C. § 4332(2)(c); 40 CFR § 1502.16.

ROSE LAW FIRM
A PROFESSIONAL ASSOCIATION

FILE COPY

ATTORNEYS

WRITER'S TELEPHONE
501-375-0340

120 East Fourth Street
Little Rock, Arkansas
72201-2893

WRITER'S ELECTRONIC MAIL
broseenthal@roselawfirm.com

501-375-9131
501-375-1309 FAX

September 16, 1998

VIA TELECOPY and VIA FEDERAL EXPRESS

Mr. Ed Lambert
United States Army Corps of
Engineers, Memphis District
167 North Main B-202
Memphis, Tennessee 38103-1894

Re: Eastern Arkansas Region Comprehensive
Study, Grand Prairie Demonstration
Project, Draft General Evaluation Report
("Draft Report") and Draft Environmental
Impact Statement ("DEIS")

Dear Mr. Lambert:

Bunge Corporation hereby files its written request for an extension of the comment deadline on the Draft Report and DEIS. Notwithstanding the very long time period it understandably took to compile the DEIS, the Memphis District Corps of Engineers, as lead agency, has granted the shortest amount of review time allowable for public comments, namely 45 days.¹ The governing regulations note that the lead agency may extend prescribed periods.²

Time limits under the governing regulations should be set by considering the following factors:

1. Potential for environmental harm;
2. Size of the proposed action;
3. State of the art of analytical techniques;
4. Degree of public need for the proposed action, including the consequences of delay;

¹ 40 CFR § 1506.10(c). The lead agency shall not allow less than 45 days for comments on draft statements.

² 40 CFR § 1506.10(d) and 33 CFR § 230.19(a).

Mr. Ed Lambert
September 16, 1998
Page Two

5. Number of persons and agencies affected;
6. Degree to which relevant information is known and, if not known, the time required for obtaining it;
7. Degree to which the action is controversial; and
8. Other time limits imposed on the agency by law, regulations, or executive order.³

In addition, time extensions are based on the timeliness of document distribution, prior agency involvement in the proposed action, and the action's scope and complexity.⁴

While the DEIS notes that one of the three areas of controversy includes navigation, no commercial navigational interests were included in the distribution list for the Draft Report or DEIS. In fact, commercial navigational interests only recently have received copies of the final Draft Report and DEIS and have had inadequate time to thoroughly prepare appropriately researched and detailed comments affecting their navigational interests.⁵

No time limits are imposed by law or other regulation that would suggest the minimum comment period under these circumstances is appropriate.

³ 40 CFR § 1501.3.

⁴ 33 CFR § 230.19(a) and Army Regulation (E.R. - 200-2-2, Procedure for Implementing NEPA, March 29, 1996).

⁵ For example, the Draft Report projects a diminished White River, and this conclusion is based on dated data, while more current state water data is available to more accurately project the scope of this diminishment (Draft Report Vol. IV-19).

Similarly, the first cost estimates are approximately \$270,000,000 (Project Report, Table D-II-31). Annual costs are represented as \$29,256,000. Under the referenced table, navigation costs are estimated at pump cutoff levels based on 1986 data. Current state proposals requiring pump cutoff levels differ from the 1986 data and are more costly to navigation.

Mr. Ed Lambert
September 15, 1998
Page Three

Therefore, Bunge requests a reasonable extension of the comment period, which Bunge believes should be not less than an additional 120 days. Bunge respectfully requests an answer to this request to the undersigned on or before September 21, 1998.

Sincerely yours,



Brian Rosenthal, Counsel
for Bunge Corporation

-1



Reply to
Attention of:

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT CORPS OF ENGINEERS
167 NORTH MAIN STREET B-202
MEMPHIS TN 38103-1894

September 18, 1998

Planning, Programs. & Project
Management Division
Environmental & Economic Analysis Branch

Mr. Brian Rosenthal
Rose Law Firm
120 East Fourth Street
Little Rock, Arkansas 72201-2893

Dear Mr. Rosenthal:

We have received your letter dated September 16, 1998, requesting an extension of the comment deadline on the *Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project, Draft General Reevaluation Report (GRR) and Environmental Impact Statement*. Your comments will be considered by the Memphis District if received by October 6, 1998 (15-day extension). If Bunge Corporation representatives would like, we will brief them in our offices on the Grand Prairie Project and related impacts. Please let me know.

If you have questions or need additional information, contact Mr. Edward Lambert of my staff at (901) 544-0707.

Sincerely,

David W. Wolfe
Deputy for Project Management

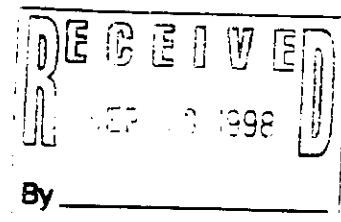


EXHIBIT B



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 28 1998

Mr. Edward P. Lambert
Chief, Environmental Analysis Branch
U.S. Army Corps of Engineers
Memphis District
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Mr. Lambert:

In accordance with our responsibilities under Section 309 of the Clean Air Act, the National Environmental Policy Act (NEPA), and the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA, the U.S. Environmental Protection Agency (EPA) Region 6 office in Dallas, Texas, has completed its review of the General Reevaluation Report (GRR) and Draft Environmental Impact Statement (DEIS) for the Proposed Plan for Water Conservation, Groundwater Management, and Irrigation Water Supply in Grand Prairie, Arkansas, Monroe and Lonoke counties, Arkansas.

The General Reevaluation Report (GRR) and Draft Environmental Impact Statement (DEIS) for the Grand Prairie, Arkansas, project area addresses the issues of water conservation, groundwater management, and irrigation water supply for eastern Arkansas. The assessment concentrated on levels of proposed withdrawals from the White River for agricultural purposes to replace the current reliance on groundwater withdrawals. Congress directed the Corps of Engineers, through the Energy and Water Development and Appropriations Acts, to select and to develop implementation plans for one area to serve as an agricultural water supply demonstration project. The Grand Prairie project was selected because alluvial aquifer depletion is comparably more severe in this area.

EPA rates this proposed action as "EC-2," i.e., EPA has "Environmental Concerns and Requests Additional Information in the Final EIS." Although the DEIS appears to be comprehensive, thorough, and to adequately address the impacts associated with the preferred action and the alternatives, we have identified several environmental concerns that need to be included in the Final EIS (FEIS) to complement and to more fully insure compliance with the requirements of NEPA and the CEQ regulations. Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act, to inform the public of our views on proposed Federal actions.

Detailed comments are enclosed with this letter which more clearly identify our concerns and the informational needs requested for incorporation into the FEIS. If you have any questions, please contact Mike Jansky of my staff at (214) 665-7451 for assistance.

EPA appreciates the opportunity to review the DEIS. We request that you send our office five copies of the FEIS at the same time that it is sent to the Office of Federal Activities, EPA, 401 M Street S.W., Washington, D.C. 20460.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Robert D. Lawrence". The signature is fluid and cursive, with a long horizontal stroke at the end.

Robert D. Lawrence, Chief
Office of Planning and Coordination
Compliance Assurance and Enforcement Division

Enclosures

DETAILED COMMENTS
DRAFT GENERAL REEVALUATION REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT
GRAND PRAIRIE AREA DEMONSTRATION PROJECT, EASTERN ARKANSAS

Background

The General Reevaluation Report (GRR) and Draft Environmental Impact Statement (DEIS) for the Grand Prairie, Arkansas, project area addresses the issues of water conservation, groundwater management, and irrigation water supply for eastern Arkansas. Investigation centered on levels of proposed withdrawals from the White River for agricultural purposes to replace the current reliance on groundwater withdrawals. The GRR had several planning objectives (p. DEIS-11). These include:

- Protect and preserve the alluvial aquifer
- Provide a supplemental water supply to meet the irrigation water needs of the Grand Prairie
- Maximize the use of conservation
- Enhance fish and wildlife habitat
- Restore native prairies
- Minimize Cost/Maximize Output

The GRR considered 7 alternatives incorporating numerous structural and non-structural measures to meet the planning objectives. Initial screening eliminated five of the alternatives, and carried two ahead for further analysis (pp. EIS-13 and EIS-14). The two alternatives were the No Action alternative and Alternative 7, the Import System Optimization alternative. Alternative 7 further consisted of a variety of water import levels, designated as Alternatives 7A through 7D (pp. DEIS-14 and DEIS-15).

The DEIS presents five alternative plans as the final array of alternatives: the No Action Alternative and Alternatives 7A through 7D. Alternatives 7A through 7D consider water conservation measures, additional water storage, restoration of native prairie vegetation, and a provision of additional waterfowl foraging habitat. However, each alternative plan considers a different level of water import. Direct construction impacts are essentially the same for all plans, but impacts and benefits to aquatic resources vary slightly. Economic costs and benefits vary with each plan. The tentative selected plan (TSP) [equivalent to the Preferred Alternative] is also the National Economic Development (NED) Plan (designated Alternative 7B) and includes:

- A 1,640 cubic feet per second (CFS) import pump system to divert water from the White River
- Utilization of approximately 291 miles of existing streams and channels
- 184 miles of new canals

- 177 miles of new pipelines
- 120 weirs to be constructed in existing streams
- Various hydraulic structures associated with a water delivery system (e.g., gated check structures, wasteways, culverts, siphons, turnouts, bridges)
- 8,849 acres of new on-farm irrigation reservoirs for water storage
- On-farm tail-water recovery systems
- The annual flooding of 38,529 acres of harvested rice fields
- Improvements in agricultural water use to achieve 70% efficiency (from current levels of 60% efficiency)

Proposed mitigation to compensate for impacts associated with construction of the import system include:

- 193 acres of cleared land would be acquired in fee title and planted in upland hardwood trees
- 243 acres of agricultural land would be acquired in fee title and planted in bottomland hardwood trees
- Potential restoration of prairie vegetation
- Wildlife habitat management

The estimated cost of the TSP, including mitigation, is \$270,512,000.

PROJECT DISCUSSION

Purpose and Need

The purpose and need of this DEIS centers around the findings that heavy agricultural use has severely depleted the alluvial aquifer in the Grand Prairie region of eastern Arkansas. Congress, the Corps of Engineers, the Natural Resources Conservation Service (NRCS) (cooperating agency), and the White River Regional Irrigation Water Distribution District (local sponsor) are responding to the need for water conservation, ground water management strategies, and irrigation water supply in the Grand Prairie (p. DEIS-10).

Evaluation of Alternatives

During the formation of plan alternatives, numerous structural and nonstructural measures were evaluated. Alternative 1 is the No Action alternative or the future without-project condition. Current data, including historical and current trends, well data, field observations, and ground water modeling studies, indicate that depletion of the aquifer will continue at an alarming rate. It is estimated that only 26.6% of the currently irrigated cropland will be irrigated by the year 2015 due to continued aquifer depletion (p. DEIS-12).

Alternatives 2A and 2B involved the construction of additional irrigation reservoirs

without water conservation measures or an irrigation water import system (p. DEIS-12). Alternative 2 (storage only) was dropped from further analysis because it was determined that farmers were already capturing as much of the available surface water runoff as physically possible. Constructing additional reservoirs would prevent existing reservoirs from being filled to capacity and would increase evaporation and infiltration losses (p. DEIS-13).

Alternatives 3A and 3B consisted of various conservation measures and additional irrigation water storage (new reservoirs), but did not contain a water import system. Conservation measures were designed to increase efficiency of irrigation water usage from 60% to 70% (p. DEIS-12). Detailed economic analyses were performed on Alternative 3A. The results revealed that Alternative 3A was not the economic optimum plan (NED plan) and therefore alternatives 3A and 3B are not presented in the final array of alternatives (p. DEIS-13).

Alternatives 4A and 4B combined the conservation features contained in alternatives 3A and 3B with an import system using water diverted from the White River. The construction of additional irrigation reservoirs was not included in alternatives 4A and 4B (pp. DEIS-12 and DEIS-13). Studies conducted by the NRCS revealed that conservation efficiencies could not be achieved without building additional storage reservoirs. Therefore, Alternative 4 (import system and conservation without additional storage) was eliminated from further study (p. DEIS-13).

Alternatives 5A and 5B incorporated a combination of conservation measures, irrigation water storage, and an import system with an 1,800 CFS pump station. These three basic plan components were interrelated and functionally interdependent (p. DEIS-13). Alternative 5A was eliminated because it was designed for the original 394,475 acre project area. Alternative 5B was eliminated because Alternative 7 is basically the same plan; however, Alternative 7 evaluates four different import systems instead of just one (pp. DEIS-13 and DEIS-14).

Alternatives 6A and 6B also incorporated a combination of conservation measures, irrigation water storage, and an import system with an 1,800 CFS pump station, similar to Alternatives 5A and 5B. However, Alternatives 6A and 6B increased the amount of additional water storage by 25% (p. DEIS-13). An analysis established that increased levels of irrigation water storage above the optimum level identified by the NRCS were not economically feasible. Therefore, Alternatives 6A and 6B were eliminated from further study (p. DEIS-14).

Alternative 7 incorporates a combination of conservation measures, irrigation water storage, and an import system, and is basically the same plan as Alternative 5B, except that Alternative 7 optimizes the import system. Prior alternatives were used to optimize the on-farm components of the project (conservation measures and irrigation water storage). In order to optimize the import system, on-farm components were held constant and four different import systems were evaluated as separate alternatives.

The Final Array of Alternatives

The four variations of Alternative 7 and the No Action alternative (Alternative 1 or future without-project condition) were selected for detailed analysis (p. EIS-13). Alternative 7 combines the conservation measures contained in Alternative 3 with:

- An import pump system to divert water from the White River (alternatives address 1480-1900 CFS)
- Utilization of approximately 291 miles of existing streams and channels
- 184 miles of new canals
- 177 miles of new pipelines
- 120 weirs to be constructed in existing streams
- Various hydraulic structures associated with a water delivery system (e.g., gated check structures, wasteways, culverts, siphons, turnouts, bridges)
- 8,849 acres of new on-farm irrigation reservoirs for water storage
- On-farm tail-water recovery systems
- The annual flooding of 38,529 acres of harvested rice fields
- Improvements in agricultural water use to achieve 70% efficiency (from current levels of 60% efficiency)

Native prairie grasses and possibly some prairie forbs would potentially be planted within the rights-of-way of the proposed irrigation canals. The potential planting area within these rights-of-way totals approximately 3,000 acres (p. DEIS-14). Additional cropland acreage would be managed for waterfowl within the project area under the auspices of the North American Waterfowl Management Plan (p. DEIS-15).

Alternatives 7A through 7D all have the same characteristics listed above, with the exception of differences in the import system design. This is due, in part, because the White River cannot support unlimited withdrawals due to low flows and the institutional constraints of current state law that was enacted to protect all users and the environment. Because of these constraints, four different import levels were evaluated for economic optimization corresponding to the four alternatives. On-farm components under Alternative 7 were held constant; irrigation water usage efficiency was maintained at 70% and the storage level was held constant at 88,490 acre-feet (8,949 acres of new reservoirs). Only the import levels were varied.

Under these conditions, Alternative 7A would obtain (p. DEIS-15):

- A 1,480 CFS water import system
- An average of 235,360 acre-feet of water from the White River
- 85.8% of the annual irrigation demand at year 2015
- A supply of 304,102 acre-feet more water than future without-project conditions
- A shortfall of 68,331 acre-feet

Alternative 7B (TSP) would obtain (p. DEIS-15):

- A 1,640 CFS water import system
- An average of 243,900 acre-feet of water from the White River
- 87.6% of the annual irrigation demand at year 2015
- A supply of 312,642 acre-feet more water than future without-project conditions
- A shortfall of 59,791 acre-feet

Alternative 7C would obtain (p. DEIS-15):

- A 1,800 CFS water import system
- An average of 250,227 acre-feet of water from the White River
- 88.9% of the annual irrigation demand at year 2015
- A supply of 318,969 acre-feet more water than future without-project conditions
- A shortfall of 53,464 acre-feet

Alternative 7D would obtain (p. DEIS-16):

- A 1,900 CFS water import system
- An average of 256,368 acre-feet of water from the White River
- 90.2% of the annual irrigation demand at year 2015
- A supply of 325,110 acre-feet more water than future without-project conditions
- A shortfall of 47,323 acre-feet

Environmental Impacts of the Preferred Alternative and Proposed Mitigation Measures Considered in the Draft EIS

The environmental impacts and associated proposed mitigation measures, if applicable, of the TSP (Alternative 7B) are presented by media in this section. The media that this document addresses include:

- Rivers and Streams
- Groundwater
- Water Quality
- Aquatic Resources
- Bottomland Hardwood Forest
- Upland Hardwood Forest
- Timber
- Wetlands
- Prairie
- Wildlife
- State and Federal Holdings
- Endangered and Threatened Species

- Recreation
- Agricultural Lands
- Navigation
- Cultural Resources
- Noise
- Air Quality
- Aesthetic Value
- Displacement of People
- Community Cohesion
- Local Government Finance, Tax Revenues, and Property Values
- Displacement of Businesses and Farms
- Public Services and Facilities
- Community and Regional Growth
- Employment

Rivers and Streams

Project-induced impacts to the White River would be confined within the reach from Interstate 40 (mile 126.6) downstream to St. Charles (mile 57.0). Maximum stage reductions would occur during summer/early fall when the river is low and irrigation demands are highest; the maximum stage reduction, compared to existing conditions, would be approximately one foot or less during this period. However, it is important to note that daily variability in river stages is greater than predicted project changes in river stages. Changes in stage are almost immeasurable during high-flow periods (p. DEIS-61).

The proposed action would utilize the existing tributary streams to distribute irrigation water. Supplemental water would be provided to the tributary streams, and pools would be maintained within these streams through the installation of numerous weirs. Therefore, this plan would benefit fisheries within the tributary streams (p. DEIS-61).

Ground Water

This plan would preserve the alluvial aquifer. At year 2015 and beyond, annual withdrawals from the aquifer would be limited to the long-term sustained yield (35,574 acre-feet) which would allow recharge. It is likely that the State of Arkansas will begin limiting annual withdrawals to the sustained yield several years prior to 2015 (p. DEIS-62).

Water Quality

Because water from the White River would be used in the delivery system, it is predicted that all of the canals would receive some sediment deposition. However, most of the imported sediment would be dropped in the inlet channel. For these reasons, there would be no detectable sediment drop in receiving streams (p. DEIS-62).

In addition to the sediment analysis, the Ground Water Institute at the University of Memphis conducted studies during 1996 to determine the current water quality of area streams, reservoirs, wells, and tailwater recovery systems. Conclusions from this study showed that replacing irrigation well water with water diverted from the White River would have positive effects on the farmland and receiving streams. For example, the imported water would have lower hardness and alkalinity levels and slightly higher amounts of inorganics. This should increase the long-term productivity of the land and have no adverse effects on existing streams (pp. DEIS-62 and DEIS-63).

A water quality sampling program would need to be initiated as part of the environmental management portion of the project. This sampling program should include sampling stations on the main canal at turnout locations and other sites as needed (p. DEIS-63).

Aquatic Resources

Project impacts on aquatic resources were addressed in the Waterways Experiment Station (WES) report, *Effects of Grand Prairie Irrigation Project on Fishes of the White River and Tributaries*. Generally the proposed action is projected to produce positive impacts on project area aquatic resources. This alternative would create 184 miles of new canals resulting in 8,560 fish habitat units (HUs) per month (one HU equals one acre-foot of prime fish habitat). Development of the water delivery system would involve creation of 120 weirs in tributary streams. All of these streams have been previously channelized and, generally, flows are extremely low during the summer months. Additional water from the White River and the pooling effect of the weirs would increase wetted area and habitat quality for fish. The WES study also projected an increase of 4,328 fish HUs per month over existing conditions for project area streams (p. DEIS-63).

Potential adverse impacts on aquatic resources are associated with pump entrainment of larval fishes, stage reductions in the White River that could impact littoral habitat and connectivity of oxbow lakes, and blockage of migratory pathways by construction of in-stream weirs. The WES report indicated that these potential adverse impacts would be minimal (pp. DEIS-63 and DEIS-64).

Bottomland Hardwood Forest

Under Alternative 7B, approximately 71 acres of bottomland hardwood forest would be directly impacted by construction of water distribution system components (i.e., pump station/inlet channel, canals, pipeline, weirs). Approximately 31 acres would be permanently displaced by project features, and approximately 40 acres would be cleared but allowed to reforest following construction. Two hundred and forty-three (243) acres of cleared agricultural wetlands would be acquired and planted in selected bottomland hardwood trees to mitigate losses to bottomland hardwoods and other wetlands (p. DEIS-65).

Upland Hardwood Forest

Approximately 14,940 acres of upland hardwood forest are contained within the project area. Construction of the water distribution system would adversely impact approximately 124 acres. Permanently lost would be 54 acres and 70 acres would be cleared for construction but not permanently impacted. Of the 70 acres temporarily impacted, 28 acres in and bordering Wattensaw Wildlife Management Area (WMA) would be replanted in selected upland hardwood tree species; and the remaining 42 acres would be allowed to regenerate naturally (p. DEIS-68).

In order to mitigate and offset project-induced losses to upland hardwoods, 193 acres of cleared land would be acquired and planted in selected upland hardwood trees. It is assumed that all on-farm irrigation reservoirs and conservation features would be constructed on agricultural lands.

Timber

Approximately 195 acres of timber would be adversely impacted as a result of constructing the water delivery system. Of the project-affected acreage, 110 acres would be cleared but not permanently destroyed; 82 acres would be allowed to regenerate naturally and 28 acres would be replanted. As a result of delivery system construction, 85 acres of timberland would be permanently lost. However, the project mitigation plan would include the acquisition and reforestation of 436 acres of cleared land. It is assumed that all on-farm conservation features and storage reservoirs would be constructed on agricultural lands (p. DEIS-69).

Wetlands

Construction of the water distribution system would result in the loss of approximately 24 acres of bottomland hardwoods, 7 acres of forested swamp, 30 acres of scrub/shrub swamp, 3 acres of marsh, and 64 acres of farmed wetlands. In addition, 57 acres of wetlands (35 acres of bottomland hardwoods, 5 acres of forested swamp, 17 acres of scrub/shrub swamp) would be temporarily impacted by project construction; these wetlands would be allowed to regenerate following project construction. Approximately 243 acres of cleared agricultural wetlands would be acquired and planted in bottomland hardwood trees to mitigate impacts to wetlands. It is unlikely that withdrawals from the White River could adversely impact floodplain wetlands. Moreover, desiccation of ground water wetlands along the White River within the southern portion of the Grand Prairie could be halted or slowed through implementation of this alternative. The DEIS assumed that all on-farm water distribution systems, conservation features, and irrigation reservoirs would be constructed on non-wetland agricultural lands. In order for a farmer to construct an on-farm project feature in a wetland, the farmer would have to apply for and obtain an individual Section 404(b)(1) permit from the Corps of Engineers (p. EIS-69).

Prairie

Although efforts were made to avoid locating irrigation canals and pipelines in existing prairie remnants, this alternative would impact native prairie at three locations. Canal 1000 would cross the ANHC Railroad Prairie Natural Area approximately 2.3 miles west of DeValls Bluff, Arkansas; this canal cannot be relocated due to topography. Canal 3200 would cross the Railroad Prairie approximately 2.0 miles west of Hazen, Arkansas; however, adverse impacts to the prairie will be minimal at this locale because Canal 3200 would be routed primarily through a highly disturbed portion of the old railroad right-of-way and would diagonally cross Highway 70. Also, Canal 4500 would traverse the privately owned Fairmount Prairie. No more than four acres of prairie would be lost as a result of this alternative (p. DEIS-70).

Furthermore, native prairie grasses (i.e., big bluestem, little bluestem, switchgrass, Indiangrass) and possibly some prairie forbs, would be planted in the irrigation canal rights-of-way. These rights-of-way would afford an area of approximately 3,000 acres for the potential establishment of native prairie vegetation. Since prairie restoration can be costly and time consuming, experimental plantings of these grasses must be conducted to determine the appropriate planting methodology and associated costs. The results of this experimentation would be used to ascertain the actual acreage that could be planted in prairie grasses (p. DEIS-70).

Wildlife

Approximately 118 acres of valuable wildlife habitat would be permanently impacted as a result of this plan. In addition, approximately 127 acres would be temporarily impacted as a result of vegetative clearing for construction purposes (p. DEIS-71).

The Habitat Evaluation System (HES), U.S. Army Corps of Engineers (1980), was employed to calculate habitat quality indices (HQIs) for significant wildlife habitat types in the project area. The HQIs were determined for existing conditions and projected for future conditions. A habitat unit value (HUV) was calculated as a product of habitat quantity and HQI, for each habitat type within the project area. Annualized HUV losses would occur in upland hardwood forest, bottomland hardwood forest, forested swamp, scrub/shrub swamp, and marsh. Some of the losses would be partially regained through vegetative regeneration within portions of the rights-of-way. Also, hardwood regeneration would occur on spoil piles and cleared portions of rights-of-way associated with weir construction. However, a total loss of 104 annualized HUVs would occur as a result of Alternative 7B; 436 acres of cleared land would be acquired and reforested to mitigate this loss of annualized HUVs (pp. DEIS-72 and DEIS-73).

State and Federal Holdings

The proposed action would not impact the Stuttgart National Aquaculture Research Center (SNARC) or the Rice Research and Extension Center (RREC). However, construction of

the pipeline would impact approximately 30 acres of upland hardwood forest within the southern boundary of Wattensaw WMA. Of the impacted acreage, 6.5 acres would be permanently lost and an additional 23.5 acres would be cleared for construction purposes; the 23.5 acres would be replanted in selected upland hardwood trees. Canals 1000 and 3200 would impact the Railroad Prairie Natural Area at two locations; approximately two acres of this natural area would be lost due to construction of the canals. Land and Water Conservation Act Funds were used to purchase the Railroad Prairie Natural Area; therefore, the Memphis District is coordinating (through the Arkansas Natural Heritage Commission and Arkansas Department of Parks and Tourism) property conversion approval and selection of suitable replacement property with the National Park Service. The White River floodplain wetlands within the two federal refuges would not be adversely impacted by this plan (p. DEIS-74).

Endangered and Threatened Species

The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species that utilizes the study area. One endangered fish, pallid sturgeon (*Scaphirhynchus albus*), could potentially occur within the White River; and one endangered mussel, pink mucket pearly mussel (*Lampsilis abrupta*), is known to inhabit the study area reach of the White River. Also, two other endangered mussels, Curtic pearly mussel (*Epioblasma flotentina curtisi*) and fat pocketbook pearly mussel (*Potamilus capax*), are reported to have historically occurred in the White River. However, these mussels have not been collected in recent surveys and it is unlikely that they still exist in the White River (p. DEIS-52).

This alternative should not adversely impact the pallid sturgeon. Pallid sturgeon rarely inhabit areas other than main channels of turbid rivers; therefore, slight reductions in surface water elevations should not impact this fish.

The pink mucket pearly mussel does not occur at depths less than approximately 10 feet below the water surface at low water; therefore, no adverse impacts to this mussel should occur as a result of this plan. Prior to construction of the pump station inlet channel, mussels would be removed from the portion of the White River within the construction impact zone and released in other areas of the river with suitable habitat.

The bald eagle presently occurs within the study area only as a transient species. No significant impacts to fisheries within the White River and adjacent oxbow lakes are anticipated, and no significant tree loss would occur near the White River. Therefore, no adverse impacts to the bald eagle are projected (p. DEIS-75).

Recreation

The flooding of approximately 38,529 acres of harvested rice fields each winter would generate 28,769 waterfowl hunter-days annually; it is estimated that approximately \$860,760 would be expended annually on waterfowl hunting within the project area. In comparison with

future without-project conditions, this represents an annual increase of 15,023 waterfowl hunting man-days and \$449,480 in related expenditures over the 50-year project life of this study.

There is insufficient site specific data for estimating hunter-days and economic values for other forms of recreation. It is probable that losses in habitat value associated with construction of the water distribution system would adversely impact hunting of woodland wildlife species and some forms of non-consumptive recreation (e.g., bird watching); however, any impacts should be slight and offset by the mitigation plan (i.e., reforestation of cleared lands).

The minor loss of Habitat Units should not significantly impact sportfishing on the White River, and oxbow lake fishing would not be impacted. Furthermore, construction of the irrigation canals and reservoirs would provide additional fishing opportunities within the project area (p. DEIS-76).

Agricultural Lands

Construction of the water distribution system and associated storage system would result in the loss of approximately 3,795 acres of agricultural lands. Of the acreage lost, approximately 3,695 acres would be prime and unique farmland and 77 acres would be farmland of statewide and local importance. In addition, it is estimated that 8,849 acres of on-farm irrigation reservoirs would be constructed in agricultural lands; however, the exact locations of these reservoirs have not yet been determined. Although cropland would be lost as a result of this plan, the overall benefits to agriculture would overshadow the direct impacts associated with construction.

At year 2015 and beyond, 209,046 acres of cropland would be irrigated each year; this is 155,092 more acres than could be irrigated under future without-project conditions during the same time period. Under future without project conditions, approximately 77% (184,753 acres) of the presently irrigated cropland would be converted to dryland agriculture by the year 2015. Only about 12% (29,661 acres) of the presently irrigated cropland would be converted to dryland agriculture under Alternative 7B. By the year 2015, only 694 acres would remain in aquaculture (i.e., catfish and bait fish farming). However, this plan would provide an estimated 2,689 acres of aquaculture ponds (p. DEIS-77).

Cultural Resources

Surveyed portions identified 162 historic and prehistoric sites in the project area. Prior to project construction, any unsurveyed portions of project rights-of-way would be surveyed; and testing would be conducted to determine if any cultural resources sites are significant (i.e., eligible for nomination to the National Register of Historic Places). Any significant sites, must be avoided during construction or mitigated before construction in the immediate vicinity of the sites is initiated (p. DEIS-78). Cultural resources impact are being coordinated with the State Historic Preservation Officer.

Noise

Noise would increase during initial construction due to equipment operation. Following construction, noise levels should return to normal over most of the project area. However, noise would increase in the vicinity of the pump station during operation of the pumps. It is highly probable that totally electric pumps would be used instead of diesel pumps or electrical pumps powered by diesel generators; use of totally electric pumps would significantly reduce noises associated with the pump station (p. DEIS-79).

Air Quality

Machinery emissions and airborne dust during construction and maintenance activities would slightly degrade air quality. However, it is anticipated that project-related impacts to air quality would be minor and of short duration (p. DEIS-79). No significant impacts are anticipated.

Aesthetic Value

Vegetative clearing associated with construction of the import system would reduce the aesthetic value of the project area. The construction of canal levees and other features would alter the appearance of the landscape; however, establishment of native prairie vegetation within the canal rights-of-ways should offset and mitigate the adverse impacts associated with construction of project features.

Displacement of People

This alternative would not result in the displacement of people. However, it could halt or significantly lessen the displacement of the area's residents expected under future without-project conditions. Under future with-project conditions, the area's income would be greatly enhanced over the levels expected without the project, thereby preventing the expected loss of area employment (pp. DEIS-79 and DEIS-80).

Community Cohesion

Concern is present within the project area relative to the project sponsor's plans for taxation to finance its share of the project cost. Some landowners question the present need for the project and are opposed to additional taxes. Other landowners are concerned over providing the necessary rights-of-way for project construction. No additional impacts to community cohesion are anticipated (p. DEIS-80).

Local Government Finance, Tax Revenues, and Property Values

This alternative would halt or significantly reduce the erosion of property values and tax

base expected under future without-project conditions thereby maintaining revenues from taxes to the local government entities (p. DEIS-80).

Displacement of Businesses and Farms

No businesses or farms are expected to be displaced either directly or indirectly as a result of this alternative. The area's agricultural income would be greatly enhanced over the levels expected without the project which would maintain the profitability of the area's businesses and farms. This alternative would stop displacement of the area's businesses or farms expected under future without-project conditions (p. DEIS-80).

Public Services and Facilities

This alternative would prevent the erosion of property values and corresponding decrease in tax base expected under future without-project conditions. This would maintain the area's ability to provide such basic public services as education, police protection, and roads and bridges (p. DEIS-80).

Community and Regional Growth

This alternative would not contribute appreciably to community and regional growth. However, it would prevent the declines expected in the region's economy under future without-project conditions. It would maintain the area's agricultural and agricultural related production, farms and businesses, income, employment, tax base, public services, and urban and rural population necessary to maintain the area's economy at present levels (p. DEIS-81).

Employment

This alternative would prevent the expected declines in agricultural and agricultural related employment along with any decreases in secondary employment expected under future without-project conditions. There would also be some opportunities for new employment associated with project construction, operation, and maintenance (p. DEIS-81).

Agency Coordination/Consultation on Federal Cross-Cutting Laws

The GRR and DEIS discuss agency coordination and consultations that have occurred or are planned to occur. Volume 9, Appendix C, Section VI contains copies of consultation correspondence with state and Federal agencies.

GENERAL COMMENTS:

The Draft General Reevaluation Report and DEIS provides a general description of the proposed Grand Prairie Area Demonstration Project for Eastern Arkansas. Although a

detailed economic analysis is provided, a corresponding in-depth environmental analysis of project effects is not contained within the document. The DEIS need strengthening in the following areas (see detailed comments in the following section):

- ▶ The format of the document is confusing. The DEIS does not provide a substantive analysis of alternatives other than the preferred (TSP) alternative. Differences between the alternatives have not been adequately assessed. In particular, the varying effects of the alternative levels of White River withdrawals should be addressed.
- ▶ The specifics of the proposed activities (details on pumps, pipelines, canals, and associated structures) have not been addressed in the DEIS. The specific environmental effects of the project's construction and implementation should be fully assessed in the FEIS.

A number of resource areas are either not evaluated at all in the DEIS or are only briefly described, including Geology and Soils, Transportation, Land Use, Noise, Visual and Aesthetic, and Utilities. The FEIS should provide explanation for those resources that were not addressed in the document.

- ▶ In general, impacts to water quality and aquatic resources need to be more detailed. For example, turbidity impacts to the White River and tributary streams should be fully analyzed as a function of the proposed water distribution system's throughput.

SPECIFIC COMMENTS:

Clean Air Act

"Coordination of the DEIS will bring project into full compliance" (p. DEIS-6, Table 1-1). The DEIS does not specifically indicate whether a general conformity analysis is required. Please clarify in the FEIS.

Clean Water Act Section 402(p)

The DEIS does not address whether NPDES permits are expected to be necessary for the proposed activities. Non-point agricultural run-off is not addressed in the document. Please address in the FEIS.

Safe Drinking Water Act (SDWA)

The DEIS does not indicate that the SDWA is applicable in regards to the White River and the proposed action. Please clarify in the FEIS.

Endangered Species Act, Section 7

There are two Federally listed endangered species that occur within the project area (White River). The bald eagle (Federally threatened) is a transient species but no nests are known to occur within the study area. The GRR states that "All project-related matters concerning these species were coordinated with the U.S. Fish and Wildlife Service." (GRR, p. 21. Also see p. 36 and Volume 9, Appendix C, Section VI coordination correspondence).

The DEIS states that "None of the proposed plans would harm any threatened or endangered species or their critical habitat." (p. DEIS-3, Section 1.6)

The DEIS makes no mention of any state-listed threatened or endangered species. Please address in the FEIS.

The National Historic Preservation Act, Section 106

Surveys conducted for the GRR and DEIS identified 162 historic and pre-historic structures. (p. DEIS-58, Section 5.79). No specific Section 106 consultations are apparent. Please address the cultural resource issue and coordination requirements with the State Historic Preservation Officer in the FEIS..

Native American Tribal Government Consultations

Copies of the GRR/DEIS were provided to representatives of two tribal governments. If there are any issues, please address in the FEIS.

Environmental Justice Analysis

Over the past two decades, there has been increasing concern over environmental impacts in minority and low-income populations. To address these concerns, President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations" (hereafter, EO) on February 11, 1994.

NEPA mandates that Federal agencies fully consider environmental factors when proposing activities, programs, and policies which have the potential to significantly affect the human environment. Although social and economic impacts have always been a consideration in NEPA reviews, the Executive Order highlights the necessity to better integrate the consideration of human health, social, and economic effects into the NEPA process. The EO calls for collection and analysis of information on race, national origin, income level and other appropriate information for areas surrounding projects that have expected environmental, health and economic effect on those populations. We have enclosed a copy of the EPA Final guidance on NEPA

implementation of the EO and to assist you in your analysis.. Please document your EJ analysis in the FEIS.

Analysis of Alternatives

The DEIS analyzes the TSP to a much greater extent than the other alternatives and often states that impacts associated with all of the alternatives are identical. The DEIS does not evaluate the impacts associated with increasing the amount of withdrawn water under each alternative (i.e., an 8.64% increase in the amount of water between 1480 CFS and 1620 CFS, and a 14.74% increase between 1620 CFS and 1900 CFS). An alternative-specific analysis of water withdrawals from the White River should be included in the FEIS.

DEIS Contents

Neither the DEIS nor Appendix C (Environmental) contain a list of abbreviations and acronyms. Such a list would help the general public and other reviewers by improving the readability of the document. Please include in the FEIS.

DEIS Citations

Citation of appendices was not done consistently throughout the DEIS. Appendices to the GRR should be specified in the FEIS where relevant.

Land Use

The DEIS does not adequately discuss the patchwork of private and public lands in the project area that would be impacted by the TSP. The FEIS should address how jurisdictional or boundary issues will be addressed in the TSP, including specifics on easements, purchases, or other plans for ensuring that privately held lands will be available for the project.

Mitigations

The DEIS does not provide specific time periods and deadlines for the implementation of mitigation measures, relative to project implementation. Please incorporate mitigation timeliness in the FEIS.

DEIS Format

The format of the DEIS is confusing and it may be difficult for the public to determine exactly what actions are being proposed, and the probable environmental impacts of these actions. At a minimum, the FEIS should provide a timeline of the various plans, clearly identify active alternatives for the purposes of NEPA analysis, and maintain consistent terminology throughout the document. For example, area maps in Appendix C, Section VII:

Habitat (Wetland) Maps should be referenced where appropriate and other findings presented in the appendices should be referenced consistently.

White River Dredging

The FEIS should address the proposed action's potential for increased dredging requirements of the White River necessitated by the anticipated water withdrawals.

Projected Water Demands

The FEIS should address whether withdrawals from tributary streams for agricultural purposes are expected to increase in the future to address the projected shortfall in water resources anticipated under 7B (59,791 acre-feet/yr at 2015 and beyond); and whether these withdrawals will exceed the benefits of supplemental water that would be provided under the proposed project.

Flow Evaluation

The FEIS should address the Game & Fish Commission letter requesting the Corps complete a comprehensive in-stream flow evaluation on the White River near DeVall's Bluff.

Impacts on Tributary Streams

The DEIS states that "supplemental water will be provided to the tributary streams..." but does not specifically state what quantities would be transferred to specific tributaries under the proposed action. These quantities are crucial to determining impacts to individual tributaries. Please clarify in the FEIS.

Groundwater

The DEIS states that the TSP would "preserve the alluvial aquifer" but gives insufficient data to support this conclusion. For accuracy, the FEIS should state that implementation of the TSP alone will not "preserve the alluvial aquifer" since limits on withdrawals from the aquifer is a state decision. In addition, issues related to agricultural interests that elect not to participate in the program should be addressed.

Water Quality

The FEIS should address the water quality impacts on the White River of the construction of the pump station and inlet channel proposed for water withdrawals. Specifically, the analysis should address increased turbidity and impacts on downstream fisheries as a result of the construction and potential maintenance dredging required by the project.

Irrigation System Dewatering

The FEIS should address the frequency in which the proposed irrigation system is expected to be dewatered, and the potential impacts on tributary streams of these events.

Cumulative Water Quality Impacts

The FEIS should address the cumulative impacts on White River water quality due to the planned realignment of Highway 70 in the vicinity of the proposed pumping station and the construction of a new bridge over the White River.

Sediment Loading and Future Dredging

The DEIS does not address projected sediment loadings on tributary streams based on the different flow rates (ranging from 1480-1900 CFS) corresponding to the different alternatives and whether future dredging of tributary streams is projected to be necessary. Please address in the FEIS.

Aquatic Resources

The DEIS does not fully address or analyze the concerns expressed by a state commission about the potential impact of weirs on the hydrology of riparian plant communities. Please address this issue in the FEIS.

Zebra Mussel Impacts

The FEIS should address the potential impacts of the widespread introduction of zebra mussels into tributary streams as a result of the proposed project.

Timber

The figures for forest acreage within the project area are not consistent between the two references within the GRR. (p. 11: 42, 313; p. 20: 41,957). Please clarify in the FEIS.

Bottomland Hardwood Forest Mitigation Allowances

Mitigation measures include acquiring 243 acres to mitigate impacts to bottom land hardwoods. The 243 acres was calculated in the Habitat Evaluation System (HES) which included bottom land hardwoods, forested swamps, scrub/shrub, and marsh lands. The DEIS does not, however, stipulate how much of the 243 acres will be available specifically for bottomland hardwood revegetation. Please clarify in the FEIS.

Timber Section Distinction

The DEIS does not explain the relationship between the bottomland and upland hardwood sections and the timber section. In this case, the timber section is an overview and totaling of the impacts and mitigation of the previous sections and presents no new data. Please address in the FEIS.

Wetlands

The GRR and DEIS should be consistent in characterization of estimated wetlands losses due to the proposed activities. GRR p. 54 states that there would be a "loss of approximately 245 acres of wildlife habitat and 121 acres of wetlands." GRR p. 89 states that wetlands impacts are expected to be: "64 acres lost; 57 acres temporarily impacted"; consistent with p. DEIS-23. Appendix C, p. IV-4 states that "construction of the project would result in the loss of approximately 128 acres of wetlands. In addition, it is estimated that 57 acres of wetlands would be temporarily impacted." Please clarify in the FEIS.

Endangered and Threatened Species

The DEIS should address possible impacts to the Federally listed endangered species Interior Least Tern, as indicated in the USFWS correspondence of May 8, 1998. Consultation on this matter should be incorporated in the FEIS.

Bald Eagle Nests

The DEIS states that "no significant tree loss would occur near the White River" but does not address whether the area proposed for clearing coincides with any temporary bald eagle nests locations. Please address in the FEIS.

Recreation

The DEIS states that the flooding of additional acreage of harvested rice fields would generate additional waterfowl hunter-days and related expenditures (pp. DEIS-75 to DEIS-76, Section 6.73). These figures assume public access to these lands, which is not consistent with the statement that the USFWS "have noted that the general public would not have access to hunt waterfowl on these lands." (p. DEIS-4, Section 1.13). Please clarify in the FEIS.

Agricultural Lands

The FEIS should address the erosional impacts of the proposed action, specifically on tributary streams due to the additional water from the White River that "would provide minimum summer water levels that are substantially higher than existing summer levels."

Navigation

This resources area is not adequately evaluated in the DEIS. The increased movement of commodities, which are projected to rise 98 percent by the year 2056 (page DEIS-57), and the increased need for capacity are not evaluated in relation to the TSP. Please address in the FEIS.

Cultural Resources

The GRR and DEIS are inconsistent in numbers of sites identified through the cultural resources survey. Please clarify in the FEIS.

Air Quality Analysis

The DEIS states conclusions regarding air quality impacts without providing analytical or modeling support for them. In particular, construction impacts on air quality for the lifespan of the construction project should be fully addressed.

Cumulative Impacts

The FEIS should identify other current and proposed withdrawals from the White River and provide analysis of the cumulative impacts of these withdrawals on flow rates, particularly during annual low flow periods and drought periods. For example, the proposed action is only one of five proposed projects in the area, including two that would withdraw water from the White River. The FEIS should evaluate rivershed-wide cumulative impacts, particularly under drought conditions.

Construction

The GRR states that "A plan will be developed which identifies procedures to avoid and/or minimize adverse construction impacts". Such impacts should be identified and analyzed in the FEIS, and potential mitigations identified in order for the public and reviewing agencies to have complete information on the impacts of the proposed activities. Issues that should be analyzed include duration of specific construction projects, numbers and source of workers, socioeconomic impacts of construction, transportation, impacts on local businesses, air quality, and soils and erosion.

T H E N A T U R A L S T A T E
C H A P T E R

SIERRA CLUB

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September 18, 1998

Commander
Memphis District Corps of Engineers
167 North Main Street, B-202
Memphis, TN 38103-1894

Re: Eastern Arkansas Region Comprehensive Study (EARCS), Grand Prairie Area Demonstration Project (GPADP), Draft General Reevaluation Report and Draft Environmental Impact Statement (DEIS)

Dear Sir:

I write on behalf of the Arkansas Chapter of the Sierra Club, we appreciate you providing us with a copy of the subject studies and an opportunity for us to comment. More time would have been helpful in evaluating the study. Never the less, the Chapter has some general observations which we would like to place in the record at this time.

First of all, it seems that the economic analysis, which ultimately must be the justification for this project, is flawed.

It appears that the only economic costs considered are those related to the money outlays associated with construction and maintenance of the irrigation project and associated conservation efforts. Stated differently, no economic value is placed on the water to be relocated by this irrigation project. An assumption that the water to be transported has no economic value in its original location would seem to be unjustified, economically speaking, especially as navigation interest are already seeking a dredging project to deepen the channel of the White river over much of its length. A valid economic approach would seek to determine the increase in value if any of the water imparted by its relocation and compare that increase to the cost of performing the relocation.

Analysis of Indirect economic cost and benefits are similarly flawed. While the report notes the loss of some valuable wildlife habitat, this appears to relate only to discrete locations that will be destroyed in construction of the pipeline and not to the diffuse impacts that might result in the area from which the water is being extracted. It is difficult to believe that extraction of substantial waters from the White river will not impact wildlife habitat in the basin at large. If so your study does not appear to account for this loss. In short, it appears that your study simply assumes no economic value (direct or indirect) for the water in its current location and this is simply not a reasonable assumption.

On the flip side, the direct economic benefits appear to be based on the market value of the crop (rice) presumed to be produceable. This again appears to be an

oversimplification and an invalid economic approach. The choice here is not likely between the production of rice and the production of nothing. Without the irrigation project, there are doubtless other crops that could be grown on a sustainable basis. It is only the difference that should be claimed as a benefit. Likewise, the study seems to assume that additional flooded acreage in the irrigated area is beneficial to wildlife (water fowl) without in fact establishing that there is currently a shortage of flooded fields during the relevant seasons.

Finally on the economic front, crop prices and capital costs have been determined by utilizing snapshot data prevailing at a specific point in time, rather than a relevant historical average. This appears to be of particular importance since the cost benefit ratios generated in your study, even with the above flaws, appear to be marginal.¹

These flaws aside, the Chapter's greatest concern is the potential for widespread adverse environmental impacts. The Chapter is concerned that the environmental analysis in this instance is being performed in isolation and does not consider other planned activities, including other irrigation projects, and a proposal to dredge the White River. A study which does not include all relevant factors is fundamentally flawed and provides an inadequate basis for rational decision-making. Likewise, a failure to consider widespread diffuse impacts and future demands on these water resources flaws the reports environmental analysis.

Finally, we are not satisfied that the report demonstrates an adequate consideration of all conceivable alternative approaches to solving the aquifer depletion problem in the area of interest. Reforestation to enhance aquifer recharge is not discussed, nor more glaringly is resorting to alternative crops that are less water-intensive.

The Chapter recognizes the importance of agriculture to the State's delta region. However, in the long run, methods and practices must be developed that are sustainable. Many of the conservation and land impoundment methodologies addressed in your study, if adopted earlier, could have forestalled the aquifer-depletion crisis which this irrigation project is intended to address. These efforts and a reduction in rice acreage could solve it at not expense to the public or the environment.

Aquifer depletion is a problem that extends beyond the area to be irrigated by this demonstration project. If sustainable practices are not to be encouraged as the solution of choice in this area how can we urge them as a solution in the next, and where will the water for that area come from and at what cost to the tax payer and the environment?

In the Chapter's view, it is highly unlikely that a public subsidy, in the form of transplanting water from one area of the State to another, in order to support

¹ It is also unclear whether your economic analysis takes into account the possibility that the desired volumes of water will not be removable under State law. IF the river level will not allow irrigation what will this do to the economic viability of the project and how will the water be rationed?

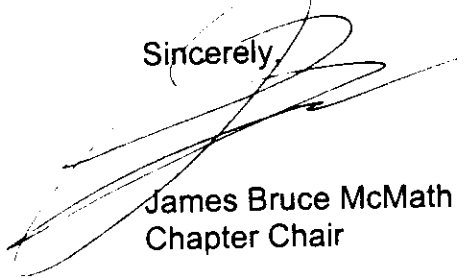
09/18/98
Page Two

unsustainable agricultural practices, can be justified economically, and removing water from the White river basin and putting it on rice fields will almost certainly represent a net loss from an environmental and wildlife habitat standpoint.

Whether this is the case or not, it is important that public policy on this matter be based on a balanced, thorough, and objective consideration of all relevant economic and environmental issues. The above mentioned flaws raise questions about whether the subject report can provide that decision making foundation.

We look forward to hearing from you with regard to your response to these remarks, and an opportunity to comment further at any public hearing that may be held.

Sincerely,

A handwritten signature in black ink, appearing to read 'James Bruce McMath', is written over the typed name and title.

James Bruce McMath
Chapter Chair

JBM/lkc



People and Nature: Our Future is in the Balance

NATIONAL WILDLIFE FEDERATION

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September 21, 1998

Commander
U.S. Army Corps of Engineers
Memphis District
167 North Main Street, B-202
Memphis, TN 38103-1894

RE: Grand Prairie Area Demonstration Project (GPADP), Draft General Reevaluation Report
and Draft Environmental Impact Statement (DEIS)

Dear Sir:

The National Wildlife Federation (NWF) is the nation's largest non-profit conservation organization, with more than 4 million members and supporters, 46 state affiliate organizations, and eight regional offices. NWF's Gulf States Natural Resource Center conducts advocacy and education programs in Arkansas, Mississippi, Louisiana and Texas focused particularly on protection and conservation of wetlands and wildlife habitat.

NWF has recently become aware of several projects proposed in the White River basin in Arkansas which have the potential, individually and cumulatively, to threaten some of the most important bottomland hardwoods and other wetlands in the southeastern United States. These projects include the Grand Prairie Area Demonstration Project (GPADP), additional irrigation projects under study as part of the Eastern Arkansas Region Comprehensive Study (EARCS), and a navigation improvement project on the White River.

NWF is greatly concerned that withdrawals of water from the White River and its tributaries for irrigation purposes will dramatically change the existing hydrology of the region and damage important bottomland and riverine ecosystems. The Draft Environmental Impact Statement and related documents prepared for the Grand Prairie project fail to address in sufficient detail a number of important resource issues. These include:

1. Ecological and water quality impacts of converting existing and natural drainages and wetlands to conduits and reservoirs for the project;
2. Effects on the White River National Wildlife Refuge of toxic metals, nutrients, pesticides and other contaminants that may be carried by irrigation waters into the system and subsequently into the Refuge;
3. Impacts of water withdrawals from the River on minimum stream flows necessary to

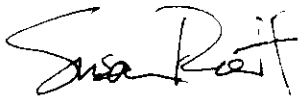
- support fishery resources;
- 4. Effects on the Lagrue Bayou mussel beds;
- 5. Lack of specific and enforceable mitigation and conservation measures (the project relies heavily on voluntary measures).

While the Grand Prairie project alone raises serious environmental issues, these cannot be properly evaluated independently of the other irrigation and navigation projects under consideration. The potential cumulative impact of these projects is substantial and could affect wildlife habitat and natural communities throughout eastern Arkansas. NWF is specifically concerned that taken together these projects will destroy diverse wetlands throughout the region, harm fish and wildlife populations, cause shifts in vegetative communities, reduce water quality, and threaten the health of the White River National Wildlife Refuge.

The National Environmental Policy Act and regulations adopted by the Council on Environmental Quality recognize the federal government's duty to consider cumulative impacts of proposed actions. The Grand Prairie Area Demonstration Project, the other irrigation projects contemplated in the Eastern Arkansas Study, and the proposed navigation project will cause cumulative impacts as defined by the CEQ regulations. A cumulative environmental impact analysis therefore must be conducted for the affected region which fully evaluates the ecological, hydrological, water quality and other impacts of all proposed projects, which demonstrates how impacts to wetlands will be avoided, and identifies specifically how mitigation will be ensured for all unavoidable wetlands losses. This cumulative EIS must be completed and reviewed before final approval of any of the study projects.

Thank you for your consideration of these comments. Please include my office on your mailing list for all materials and information related to these and any other irrigation and navigation projects in eastern Arkansas.

Sincerely,



Susan Rieff
Senior Director, Gulf States Natural Resource Center
National Wildlife Federation



IN REPLY REFER TO

United States Department of the Interior

FISH AND WILDLIFE SERVICE

1500 Museum Road, Suite 105
Conway, Arkansas 72032

October 5, 1998

Colonel Daniel W. Krueger
District Engineer
U.S. Army Corps of Engineers
167 North Main St., Room B202
Memphis, TN 38103-1894

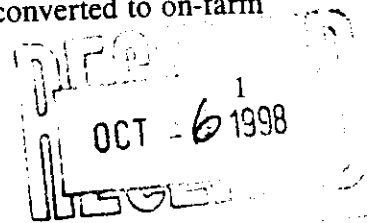
Dear Colonel Krueger:

The Fish and Wildlife Service (Service) has reviewed the information contained in the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project (GPADP), draft General Reevaluation Report (GRR) and Environmental Impact Statement, along with your letter dated July 29, 1998. A copy of the Fish and Wildlife Coordination Act Report, dated May 1998, was included in the draft GRR. Our comments are submitted in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e.).

The purpose of the study is to determine the feasibility of plans for groundwater protection and conservation, agricultural water supply, and waterfowl management, as well as other related improvements for the Grand Prairie region in east central Arkansas. It is projected that continued withdrawals at the current rate could deplete the alluvial aquifer within the next twenty years. The Water Resources Development Act (WRDA) of 1996 reauthorized the Grand Prairie Region and Bayou Meto Basin, Arkansas Project to include groundwater protection and conservation, agricultural water supply, and waterfowl management.

The GPADP offers a partial solution to the escalating problem of pumping from the area's aquifer. If carefully planned and executed the project would have limited impacts on the area's resources and help slow the depletion of the aquifer. In addition, certain design features would create a net gain in benefits to ducks and shorebirds as well as increasing the prairie remnant areas. Some of the stated goals of the GPADP include:

1. The annual flooding of 38,529 acres of harvested rice fields for ducks. Providing an additional 12,275,949 duck-use-days per year.
2. An increase in on-farm storage and other water conservation methods. According to the draft GRR and EIS, an additional 8,849 acres of cropland would be converted to on-farm



- storage reservoirs, providing 88,493 acre-feet of storage capacity. In addition, there would be an increase in the number of tailwater recovery systems.
3. Reduction in the amount of water pumped from the aquifer for agricultural use.
 4. Re-establishment of native prairie vegetation within the rights-of-way of new irrigation channels.

Throughout the draft GRR and EIS these goals are repeated and data is presented showing how the project would reduce the amount of water pumped from the aquifer for irrigation. However, we are concerned about the implementation of some project features since several of the key components of the project are based on voluntary participation. One of these components is on-farm water management, which is necessary for the GPADP to be successful. Yet the draft GRR states that the building and management of tailwater recovery systems, reservoirs, and/or reduced aquifer pumping is voluntary. Some form of water conservation should be made a mandatory part of the project requirement for participants. It is also important to note that tailwater recoveries and reservoirs, built as part of the GPADP, would not be required to be located on agricultural land. This raises concerns for additional wetland impacts. Flooding cropland to provide waterfowl feeding and resting areas is another part of the project which would be done on a voluntary bases.

Other points of concern are recreation, mitigation, and water quality issues. Though the Service and the Corps of Engineers (Corps) are within nine acres on our mitigation estimates, there is a important difference of opinion on the amount, duration, and type of management needed for the project's mitigation.

A water quality survey was included in the draft GRR and EIS. However, the Service still has concerns over water quality issues that could occur during the life of the project. We recommend that a contaminants monitoring program be made part of the GPADP.

Specific Comments:

GRR, Main Report, pg. 68

In the on-farm storage discussion section of this page several assumptions are stated. "The new reservoirs are assumed to be located on lands identified for soybean production and are equally distributed throughout the project area." and that "an additional 8,849 acres of cropland will be converted to on-farm storage reservoirs." Yet in the GRR, NRCS On-farm Report (appendix A, pg. 59), it clearly states that participation in the on-farm program will be voluntary. The landowner would make the final decision on what conservation practices he would (or would not) practice or install. In addition, the land owner would have the final decision on the operation of any on-farm irrigation system. The Service believes for the project to be successful that water conservation measures such as tailwater recovery systems, reservoirs, and/or reduced aquifer pumping must be made a mandatory part of the project for all participants.

EIS 4 Paragraph 1.13

The project as designed would not provide recreational opportunities to the general public. There are project features to flood cropland for waterfowl on private lands, but the general public would have no access to these areas. Although the Corps has stated, "recreational development is a low budgetary priority under the current Corps policy", the Service still recommends that you actively pursue the possibility of purchasing and/or enhancing additional wildlife habitat for public use within the project area. Plans and designs of such areas should be developed in a cooperative effort with the Service, Corps, and Arkansas State Game and Fish Commission.

EIS 5 Paragraph 1.14

There are some concerns about the height and placement of some of the one hundred and twenty weirs that would be constructed in existing tributaries as part of this project. The elevation differences of a number of the weirs and top banks of their respective channels is sometimes as little as one foot. Poor design consideration and weir placement could cause the pooled water to adversely impact the riparian plant communities of these tributaries. It was recommended that additional investigations be conducted to determine which of the weirs need to be redesigned or moved in order to avoid adverse impacts to sensitive areas.

EIS 75 Paragraph 6.73

In this section, under recreation, the Corps states that "the flooding of 38,529 acres of harvested rice fields each winter would generate 28,769 waterfowl hunting man-days annually..." Yet, in the NRCS On-farm Report (pg 59), it states that "participation in the on-farm program will be voluntary." The flooding of agricultural land for waterfowl feeding and resting areas should be made a mandatory part of the project, with waterfowl rest areas identified and incorporated into the project design.

EIS 94 Paragraph 8.13

Though the Service and the Corps employed different methods to analyze the projects impacts to wildlife habitat, and to determine compensatory mitigation requirements, there were only nine acres difference between the mitigation estimates. However, the Corps has stated that their mitigation requirements were determined based on insurance of 66 percent seedling survival one year from planting and no forest management once this seedling survival objective was obtained, "... had it been assumed that intensive management practices would be implemented over the 50 year project life, the mitigation acreage estimate would have been less." We feel that there must be some assurance that the values projected for the project mitigation will be achieved. However, intensive management of the project mitigation areas would not necessarily be needed achieve this goal. After the survival rate is established, the mitigation area could be placed in caretaker stasis with a minimal management required. Therefore, while there is no objection to the proposed seedling survival rate, we still maintain that management of mitigation lands should be at project expense over the 50 year life of the project.

We recommended that all mitigation acreage should consist of prior converted croplands or farmed wetlands. The Corps commented that damage to upland forest should be mitigated for by the reforestation of upland acreage. We have no objection to this mitigation.

EIS 95 Paragraph 8.14

We recommend that contaminant surveys be made before and after project completion. Though a water quality assessment was made for this report (GRR, Environmental, Section III) the study seemed to concentrate its conclusions on how the water from the White River would effect agriculture. In fact, the summary and recommendations of the report (pg 53) only allude to the possible impacts of the White Rivers water on farmland. To balance this study, more data should be collected and a baseline established so it will be possible to monitor for any future increases in pesticides, fertilizers, heavy metals, and other contaminates that are found in association with agricultural runoff. The GPADP would, in all probability, increase the amount of agricultural run off into the White River. Therefore, we recommend a comprehensive testing and monitoring program for these contaminants be incorporated into the project and tailwater areas, such as Lagrue Bayou, be monitored. This monitoring should be set up for the life of the project to protect resources that fall within the scope of the project area. In addition, to protect the unique wildlife area of White River National Wildlife Refuge, one of the areas monitored should be Jacks Bay on Lagrue Bayou.

EIS 95 Paragraph 8.15

We recommended that irrigation canals and on-farm reservoirs be located away from wetlands and natural heritage sites. Incorporating design recommendations from other resource agencies, the Corp aligned the proposed canals and pipelines to minimize as much as possible impacts to forest, wetlands, and prairie remnants and in Vol. 1, On-Farm Storage pg. 44, the statement is made that, "All reservoirs would be placed on cropland." However, in a later section of the same volume (EIS 95, 8.15) the Corp states that "It is assumed that on-farm project features would be constructed on non-wetland agricultural lands." We feel that this assumption is unwarranted. In fact, it is far more likely that the land used to create reservoirs and tailwater recovery systems would be land that is considered unsuitable for farming, such as a wetland drains or sloughs. And though it is true that the farmer would be required to "apply for and obtain an individual Section 404(b)(1) permit", wetland protection should be the responsibility of this project and not transferred to another program. Without a mandatory requirement for the on farm storage to be placed in non-wetland areas there would be significantly greater wetland impacts associated with the project.

EIS 97 Paragraph 8.23

It was recommended that the cumulative impacts of all five irrigation projects proposed in the Eastern Arkansas Project (EAP) be addressed. The Corps offered that any future Corps projects involving the White River would address the cumulative impacts of that particular project and

the GPADP. The reason given for this was that only two of the five irrigation projects proposed in the EAP involved withdrawal from the White River, the GPADP and the White River Irrigation Project. The other three projects are located in different basins.

We feel strongly that the cumulative impacts of all projects involving the White River should be addressed in detail. The demands of navigation, agricultural irrigation, and regulated flow releases from the reservoirs all combine to place an inordinate amount of strain on the river's hydrologic features and the network of interrelated biological systems that rely on them. If not properly monitored and controlled, the demands for water from the river system could, at the very least, adversely impact its fisheries, riparian habitat, oxbows, bottomland hardwoods, and the wildlife which depend upon them. All these systems rely heavily on the river's seasonal flood regime. If the demands for water from the river are such that this pattern is disrupted there would be serious impacts to these natural systems.

This argument holds true for the other water systems that will be impacted by future EAP's. Therefore, we recommend that the impacts of future Corp projects in each of the basin areas and river systems be studied in-depth, along with the cumulative impacts of projects already in place, before the start of each project.

In conclusion, the project bases some important data on the assumptions that participants will voluntarily implement such key project features as water conservation, wetland avoidance, and waterfowl flooding. In order to make the draft GRR and EIS data valid, these voluntary elements would have to be made mandatory. Other important issues that should be more fully addressed include, a comprehensive contaminants monitoring and testing system, adequate mitigation for project impacts, and cumulative impacts. Before the GPADP goes forward all stated assumptions and issues should be thoroughly addressed. We look forward to continued cooperative planning on this project. Please contact Debbie Ryckley at (501) 513-4477 if you have any questions regarding these comments.

Sincerely;



Allan J. Mueller
Field Supervisor

cc:

Arkansas Game and Fish Commission, Little Rock, Arkansas

Attn: Craig Uyeda

Arkansas Soil and Water Commission, Little Rock, Arkansas

Attn: Joseph Krystofik

Arkansas Department of Pollution Control and Ecology, Little Rock, Arkansas

Attn: Steve Drown

Arkansas Natural Heritage Commission, Little Rock, Arkansas

Attn: Cindy Osborne

Environmental Protection Agency, Dallas Texas

Attn: Steve Drown

Cache River National Wildlife Refuge, Augusta, Arkansas

Attn: Dennis J. Wildner

White River National Wildlife Refuge, DeWitt, Arkansas

Attn: Larry E. Mallard

U.S. Fish and Wildlife Service, Atlanta, Georgia

Attn: Bruce Bell

Arkansas Game & Fish Commission

2 Natural Resources Drive Little Rock, Arkansas 72205

Rick Evans
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Director

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Stuttgart

Jim Hinkle
Mountain View

Dr. Lester Sitzes
Hope

Professor Dwight Talburt
University of Arkansas
Fayetteville

September 21, 1998

Colonel Dan W. Krueger
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, Tennessee 38103-1894

Dear Colonel Krueger:

Receipt is acknowledged of your letter of July 29, 1998 and enclosed copies of the Draft General Reevaluation Report and Environmental Impact Statement (along with all appendices) for the investigation "Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project".

The staff of the Arkansas Game and Fish Commission has worked cooperatively with the U.S. Fish and Wildlife Service in detailed evaluations of proposed project impacts on fish and wildlife resources under the auspices of the Fish and Wildlife Coordination Act (FWCA). We assisted in the preparation of the U. S. Fish and Wildlife Service FWCA Report dated May 1998. This is to advise that we concur with the FWCA Report, which is well written, comprehensive, and adequately describes fish and wildlife resources, concerns, and planning objectives in the study area; evaluates alternative plans; discusses adequate mitigation measures; and discusses potential fish and wildlife conservation measures.

We would like to emphasize the fact that the pipeline right-of-way for this project is presently proposed to cross the Arkansas Game and Fish Commission Wattensaw Wildlife Management Area (WMA). This has been discussed in the initial stages of planning, at which time the pumping plant site and pipeline corridor were adjusted to minimize adverse impacts to wetlands and the Wattensaw Wildlife Management Area.. The pipeline and right-of-way design, as well as impacts, compensation and/or mitigation measures should be fully coordinated with our agency and addressed in specific detail.

We have been participating in the general fish and wildlife restoration and enhancement features such as winter water for waterfowl, higher than normal annual water levels in the irrigation ditches and waterways for fisheries resources, etc. There is no mention, however, of our previous recommendations urging you and the irrigation district to pursue the possibility of purchasing and enhancing additional wildlife habitat as part of the project somewhere in the benefited area. This

property should be set-aside for the primary purpose of wildlife management and public use. The same consideration should be given to fisheries resource features, also including public access to the resource. We feel this is an important project feature based on public funds utilized on a project of this magnitude. This and other potential fish and wildlife resource restoration and enhancement opportunities, as well as mechanisms that would guarantee features, such as winter water for waterfowl and other wildlife conservation measures based on irrigation water usage, should be put into place for the life of the project.

There should be a more thorough assessment of the project affect on transportation vectors such as zebra mussels and other exotic species. The introduction of the zebra mussel into this extensive system of waterways by this project should be acknowledged and environmental impacts addressed.

On Page EIS-20 Table 4-1, Comparative Impacts of Alternatives of the Draft Environmental Impact Statement (DEIS), it is stated that "mussels are not plentiful in the tributary stream". We understand that only limited sampling for mussels in the tributary streams was conducted at eight bridge locations. Bridge locations are known to represent disturbed stream areas, and the mussel populations at these sites unlikely represent the entire stream. We feel more intensive mussel surveys of tributary streams may be needed, particularly since records indicate Federally listed endangered mussel species are or have been known to occur in the White River Basin.

On Page EIS-20 Table 4-1, Comparative Impacts of Alternatives of the DEIS, there are discussions of larval fish entrainment studies for two years after project development. Biologists of this agency feel that the entrainment rate of 1.2 to 12% of all larval fishes is extremely high, especially for long-lived species such as paddlefish and sturgeon, because of the high discharge variability in the system and the long life spans of those species. A pulsed monitoring program should be used for post-project studies. Any significant losses of fishes directly associated with entrainment and /or impingement would require agreed upon compensation or mitigation measures between the Arkansas Game and Fish Commission, the U. S. Fish and Wildlife Service, and your agency as part of project expense.

On Page 24 of the DEIS concerning water quality issues, we feel conducting contaminant surveys before, as well as after project completion are necessary to insure that contaminant levels can be maintained at the lowest levels possible in irrigation water. It is not known if diversion of surface water for irrigation and the future operation of the irrigation system will cause any water quality problems resulting in significant adverse effects on fish and wildlife resources.

On Page EIS-97 of the DEIS, it discusses the Grand Prairie Area Demonstration Project as one of five irrigation projects as part of the Eastern Arkansas Region Comprehensive Study. Two other irrigation projects would withdraw water from the White River in addition to the Grand Prairie Demonstration Project, one would withdraw water from Bayou Meto, and one would withdraw water from the Little Red River. The Draft Reports are lacking in discussions of impacts regarding the other irrigation projects. While these projects may be separate from a construction standpoint, they are interconnected from a planning and ecological perspective. We, therefore, recommend that cumulative impacts for all five irrigation projects are thoroughly addressed in one scope of study and mitigation features are commensurate with other project planning for the life of the project.

On Page EIS-14 Alternative 7, 4.15 it is stated, "It is assumed that all new irrigation reservoirs would be built on agricultural land; approximately 8,849 acres of farmland would be lost to

reservoirs". No guarantees have been made that new irrigation reservoirs would be built on agricultural land.

We appreciate the Corps of Engineers efforts to acquire remnant prairie areas in fee title to offset losses of natural prairie habitat and the proposal to restore vegetation within 300 miles of canal right-of-way (approximately 3000 acres). In order for the proposal to result in significant benefits to wildlife resources, prairie habitat should be restored on land adjacent to remnant prairies, and other acreage not conducive to prairie habitat should be vegetated with appropriate wildlife food plantings. Obviously, more information is necessary regarding the task of prairie restoration management and assessment.

The EIS does not guarantee that groundwater resources will be protected by the project. There are no provisions that mandate farmers to stop or limit pumping water from groundwater sources and the local aquifers may still be depleted.

It is important to conduct long term studies (pre and post project monitoring) to determine project effects on fish and wildlife resources of the White River. The Grand Prairie Irrigation Project will affect the hydrology of the White River and its tributaries. The change in hydrology, depending upon the time and extent of these changes may adversely impact the ecological integrity of wetland habitats, more particularly those larger tracts of lands held in public trust. These include Federal and State Wildlife Management Areas and National Wildlife Refuges. The wetlands associated with the Cache and Lower White Rivers in Arkansas have received special designation in the United States as "Wetlands of International Importance" by the Ramsar Convention. At this time, there are no habitat models available that can adequately predict irrigation project impacts. Studies are needed since little is known about the ecology of the White River, and it is difficult for this Environmental Impact Statement to properly address impacts on ecological functions without basic biological information.

In conclusion, we will reiterate our request for additional studies, which will help identify the existing resource base and determine impacts of a Federally sponsored demonstration project. This the first inter basin transfer of water from the White River, one of the most valuable river basins and wildlife and fisheries resources in Arkansas. We appreciate the opportunity to comment on these drafts and shall look forward to continuing cooperative efforts with your office, the Natural Resources Conservation Service, the U. S. Fish and Wildlife Service, and other interests in matters pertaining to the Grand Prairie Area Irrigation Project.

Cordially,


Steve N. Wilson
Director

SNW/CKU/jah

cc: Randy Young, AR Soil &
Water Conser. Commission
Gene Sullivan/Lori Walton
White River Regional
Irrigation Water District
Rob Holbrook
Jim Sullivan
Bob Price, NRCS
Scotty May
Sonny Thompson
Jeff Quinn

Ken Bright, Memphis District, USCE
Ed Lambert, Memphis District, USCE
Allan Mueller/Deb Ryckley, USF&W
Allen Carter
Donny Harris
Steve Filipek
Jeff Farwick
Tony Stevenson, NRCS
Levi Davis
Larry Rider
Jim Goodhart
Commissioners

SOUTH ARKANSAS LANDOWNERS ASSOCIATION
Suite 1900
111 Center Street
Little Rock, Arkansas 72201

September 19, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Re: Grand Prairie Area Demonstration Project

Gentlemen:

Please accept the comments and questions contained herein on behalf of the members of the South Arkansas County Landowners Association, Inc., a non-profit organization whose members own substantial property containing or abutting natural waterways in Arkansas County, Arkansas which could be adversely affected by the Grand Prairie Area Demonstration Project.

Much has been said publicly by the local Sponsor, and by the Corps in the current report and draft studies regarding the many benefits which could result from the Demonstration Project. However, the members of this organization have tried many times in the past, without success, to get the Sponsor organization and its supporters to focus clearly on the environmental issues arising as a result of the great amount of reliance and dependence the Corps and the Sponsor place on using existing natural waterways to transmit and/or store water for the proposed project.

Outlined below are some of the principal concerns which we do not believe have been adequately addressed in the draft studies and reports to date. The order of discussion does not indicate their relative importance, as each one of these concerns, standing alone, raises serious issues relating to environmental degradation which cannot be easily mitigated even under the best of circumstances. For example, the Corps' own information pamphlet distributed in connection with a public workshop held September 15, 1998 in the project area points out the precarious balance, or lack of it, between already cleared agricultural lands (70% of the land), and remaining timbered and wetlands. (12%). The possibilities of obliterating or permanently damaging the remaining green belt areas between the Arkansas River and the White River in this region are too great to gloss over by superficial and non-scientifically based conclusions that mitigation can or will be addressed by flooding additional crop lands in the area during winter months as a means of

Commander
Memphis District Corps of Engineers
September 19, 1998
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providing additional food areas for migrating waterfowl. Theoretically providing additional water by continued pumping of White River water during dry winters is but one of many fallacies the proponents of this project have embraced in order to deflect serious study of the impact of this project on the natural world.

Concern No. 1: Fisheries Habitat

The White River, Bayou Meto, Mill Bayou, Bayou LaGrue and other streams and lakes in the Grand Prairie Area have generally been classified by the U.S. Fish & Wildlife Service as good fisheries. Many landowners, visitors and residents in the region use these areas extensively for fishing. Any channel enlargement, alteration, dredging or clearing of natural water ways to accommodate transmission or storage of water would, in our view, negatively impact the stream morphology, region-wide. In addition, we believe removal of any type of vegetation along streams and waterways, whether through deliberate project efforts, or by scouring resulting from unnaturally increased stream flows, will also have a negative effect. How would any irrigation project impact on these concerns?

Concern No. 2: Increased Pesticide/Herbicide Contamination

Any type of tail water recovery system would clearly increase the inflow of pesticides and herbicides to the water ways, streams and/or lakes in the region, as well as absorption of these chemicals into vegetation and soils in the area. Has there been any study of the effects of increased toxins upon the fish and other aquatic life found in the affected water ways? In our members' local areas, even without the presence of a super-regional district and concentrated activity as is contemplated by this project, there has been a noticeable increase in the past few years in the number of game and other fish caught which exhibit excessive lesions and infected areas along their skin surfaces. Without scientific study, the origin of this trend cannot be known for sure, although we believe it is the result of increased contaminants in the water from agricultural run off as more land has been cleared in the region for agricultural purposes. To what degree would any project contribute to this concern?

Concern No. 3: Minimum Stream Flows

During the summertime, minimum stream flows and/or satisfactory stream/lake levels would have to be maintained, to accommodate navigation and keep from destroying aquatic life and wetlands vegetation. To what degree would a project impact on these fishery needs? What will be the impact of spoilage as a byproduct of increased dredging to maintain a navigation

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channel in the White River as project pumping reaches peak levels during the normally dry growing season?

Concern No. 4: Wetlands Preservation

Much of the habitat along the natural waterways in the region, including Bayou Meto, Mill Bayou and Bayou Lagrue, consists of green timbered wetlands. What is the potential for the project's putting additional stress on or in effect destroying the vegetation and habitat in these areas? Planting prairie grass vegetation along transmission canal rights of way, while a noble effort, doesn't constitute a rational alternative to minimization or mitigation of environmental damage. Because of these concerns alone, natural waterways should simply be left out of the project plans for moving or storing water.

Concern No. 5: Increased Salinity

Is there any possibility that water might be pumped or released from the White River on occasion into natural water ways targeted to be transmission canals, when the salt content could be high enough to damage the aquatic regime? Since to some degree these water ways are being viewed by the Corps and the local Sponsor as what could be viewed as "holding ponds" for irrigation water, under the studies, water with somewhat high salt content could be placed in the reservoir areas and after sufficient detention time it could then be pumped out to the crop lands. This salt content might not damage man-made canals or ditches, or even the crop lands in the short term, but it could severely degrade the water system in any natural water ways holding or carrying this water. One control could be that the Sponsor District would be charged with responsibility to measure and control salinity entering the system, and is prohibited from introducing releases from the White River into any natural water ways affected by or carrying water in or out of the project area if, in fact, the water has a sufficiently high salt content that it should not even enter the system because of the prospect of long term damage to these water ways. Again, if the natural water ways are just removed from the project plans, contamination resulting from increased salinity would be effectively eliminated.

Concern No. 6: Authority for Making Critical Decisions

Under State law the super-regional irrigation district which is the project Sponsor has negligible requirements for qualifications of the individuals who are endowed with district governance. It is governed by five elected district commissioners, none of whom is required to represent any interest of the general public, or have any background in or to take into account the natural sciences, environmental conservation or other related disciplines fostering awareness of

the delicacy of the ecosystem which is to be affected by this project, nor to consider the environmental impact of their actions once a project is in place. Thus, even though the Corps is charged, among other scientifically based responsibilities, with preparing an environmental impact statement on the project, the district commissioners may have unfettered management authority with respect to environmental considerations once this project begins operations, unless significant limitations are placed on their discretion in these matters. Accordingly, if these district commissioners prove to be unresponsive to these concerns during the operational life of the project, for all intents and purposes fish and wildlife values along natural water courses affected by the project could take a back seat to the management, movement and withdrawal of the water from these areas, and the remedy of affected landowners to replace the commissioners by voting at the next election will be a hollow one once the damage is done. The Sponsor will have no substantial assets to make remuneration for damaged parties or properties, other than possessing the power to assess "benefits" - taxes by any other name - against the very land which has been damaged. Accordingly, it is not only appropriate and prudent, but essential, in light of the potential damage which could be inflicted on the natural water ways and water courses included in the project scope, to impose significant and scientifically-grounded environmental parameters as overriding paradigms in the operation of this project. Finally, in this regard, what weight would be given to the interests of riparian landowners, including those who are not farmers, whose lands would be affected by project operations?

Concern No. 7: Impact of Discharge on Downstream Natural Waterways

Has the Corps specifically considered the potential negative effects of increased agricultural run-off, including herbicide and pesticide concentrations, and the impact of increased scouring and siltation in natural water ways and lakes in the downstream runoff area, whether inside or outside the Sponsor's district boundaries? We note that your educational brochure refers to these watercourses as "existing channels," surely a euphemism chosen to reinforce the belief that this "channel" may be easily manipulated and controlled for human endeavor. Our organization believes that this land, which supports significant game and non-game wildlife and migratory waterfowl, will be adversely impacted with long-term and irreversible consequences for the natural wildlife in the affected areas. Claims of mitigation in other areas, whether by induced flooding of upland crop lands during winter months is of more theoretical than real benefit when the practical difficulties of maintaining this part of the project's plan are considered, as pointed out below.

Commander
Memphis District Corps of Engineers
September 19, 1998
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Concern No. 8: Winter Flooding Expectations

It is noted in the section titled "Project Description" on page 2 of the brochure available at the September 15, 1998 workshop meeting, that "[a]n important component of the selected plan is the winter flooding of 38,529 acres of harvested rice fields (on an average annual basis) for waterfowl; the flooding of crop land for waterfowl foraging habitat has been identified as critical in meeting habitat requirements of waterfowl in Arkansas as well as the entire Lower Mississippi Valley." However, we have been unable to determine exactly where funds would come from to pay for the winter flooding, since farmers in the project area will have to drain their lands in the fall to effect the harvest. Does the Corps' and the Sponsor's plan require these farmers to store that unspent irrigation water on their property, or on the property of others? What measures have been undertaken to ensure that the landowners will not have to, in effect, pay for flooding their fields twice? Are the Corps' calculations of 38,529 acres (on an average annual basis) based on the number of landowners who presently have their own reservoirs for storing spent irrigation water during harvest time and are willing to pay the costs associated with reflooding their fields? We suspect that many farmers in the proposed project area do not have existing on-farm water storage areas nor the financial means to remove land from production to convert into on-farm reservoirs, and will otherwise be unable or unwilling to pay, at the projected water sale rates, for a second, winter flooding which is stated to be critical in meeting habitat requirements of waterfowl. Has the Corps developed a "worst-case" scenario if there is minimal winter flooding, say at historical levels, in the claimed 38,529 acre area for economically- or weather-based reasons? And in light of this consideration does the cost-benefit ratio of the project need to be adjusted in the Corps' annual economic analysis, and thus do the overall numbers need to be reviewed, to take this likelihood into account?

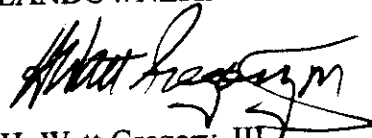
Concern No. 9: True Beneficiaries

While we note that the Corps has projected a 1.2 to 1 Benefit-to-Cost Ratio, we feel that the estimated cost of \$270,512,000 for construction of this project is an outdated and far too conservative estimate, based on environmental and other considerations we do not believe have been adequately taken into account. The number of landowners benefitting from this costly and environmentally suspect project is realistically measured in the hundreds and not the thousands. However, the number of Arkansas and U.S. taxpayers potentially paying for the State's share of this "demonstration" project is measured in the hundreds of thousands, and hundreds of millions, clearly a majority of taxpayers supporting a minority of beneficiaries. We feel that if this expenditure were put on a ballot, it would not receive enough public support to bring it to fruition because of its questionable economics and most certainly negative environmental impacts on natural waterways and wildlife inside and outside the Grand Prairie area.

Commander
Memphis District Corps of Engineers
September 19, 1998
Page 6

We ask that you review and address our concerns and delay further action on the project until all the negative impacts have been fully identified and carefully considered. Thank you for your consideration.

SOUTH ARKANSAS COUNTY
LANDOWNERS' ASSOCIATION, INC.

A handwritten signature in black ink, appearing to read "H. Watt Gregory, III". The signature is stylized with a large, sweeping "H" and a long, horizontal stroke extending to the right.

H. Watt Gregory, III
President

THE Nature Conservancy

ARKANSAS FIELD OFFICE

September 18, 1998

Commander
Memphis District Corps of Engineers
167 North Main Street, B-202
Memphis, TN 38103-1894

Re: Eastern Arkansas Region Comprehensive Study (EARCS), Grand Prairie Area
Demonstration Project (GPADP), Draft General Reevaluation Report and Draft Environmental Impact
Statement (DEIS)

Dear Sir:

The Nature Conservancy is a non-profit, non-governmental international conservation organization with offices in all states, including Arkansas. The Conservancy's mission is conservation of biological diversity, including plants, animals and natural communities, with habitats and ecological processes sufficient to insure long term viability. The Conservancy's work is science-based, and targets species and ecosystems most in need of conservation action based on rarity, viability and intactness.

I write to express the Conservancy's interest in and concerns regarding the potential negative impacts of the GPADP (and other irrigation and navigation projects) to the area termed the Arkansas "Big Woods" -- the bottomland and riverine habitats of the White River and Arkansas River and their tributaries. These large rivers are at the heart of the largest, most diverse and functionally intact wetland system in the Arkansas portion of the Mississippi Alluvial Plain. The White River supports the most intact assemblage of big river mussels and fish in the Arkansas delta. There are no other examples remaining in the Mississippi Alluvial Valley that contain such an unbroken expanse of bottomland hardwoods.

The Nature Conservancy recognized this "Big Woods" area as a conservation priority when the Arkansas Field Office opened in 1982, and has been working to document the superlative natural resource values of this system and to conserve and restore its habitats since. I am enclosing a report summarizing the natural values of the White/lower Arkansas system. The Conservancy has worked in partnership with many private individuals, corporations and local, state and Federal agencies in this effort, including Ducks Unlimited, the North American Wetlands Conservation Council, National Fish and Wildlife Foundation, American Forests, Weyerhaeuser, Potlatch, Arkansas Natural Heritage Commission, Arkansas Game and Fish Commission, and U.S. Fish and Wildlife Service.

The Nature Conservancy has reviewed the above-referenced GPADP and the related documents. We are greatly concerned that withdrawals of White River surface waters for irrigation will impact the hydrology of the of the Big Woods rivers and wetlands, and disrupt the complex interconnected functioning of this ecosystem. We are further concerned that this disruption will damage the natural values of this unique system.

Of still greater concern is the cumulative impact of this and other water development and navigation projects at various stages of planning and implementation. In addition to the GPADP, three other irrigation projects are under study as parts of EARCS will also withdraw surface water from the White River or its major tributaries the Black and Little Red rivers. In addition a Congressionally authorized navigation improvement project on the White River is under study. These planned projects will affect

stage levels on the White River in a cumulative manner. The environmental effects of GPADP and the other projects on the Big Woods cannot be evaluated without a comprehensive study of all four irrigation projects and the navigation project. The Nature Conservancy strongly urges the Corps of Engineers to conduct comprehensive studies of this ecosystem and prepare an environmental impact statement that addresses the cumulative impacts of the irrigation and navigation projects together. Analysis of cumulative impacts is required under the National Environmental Policy Act and regulations of the Council on Environmental Quality

Anticipated cumulative effects include:

1. The drying of all types of wetlands in the system, with changes in vegetation types, affecting extensive acreage of private, state and Federally-owned bottomlands and wet woods, including some 300,000 acres of publicly-owned wetlands of international significance as recognized under the Ramsar Convention
2. Decline of a diverse community of aquatic species, especially mussels, which may be affected by reduced water levels that cannot be evaluated without study of cumulative impacts.
3. Shifts in vegetation types away from those that support declining Neotropical migratory birds and reduced habitat quality for these conservation priority bird species that require forests for breeding.

The Conservancy also has specific concerns and issues regarding the DEIS.

The survey for mussels is inadequate for the small streams and bayous to be used by the project, and mussel beds are present.

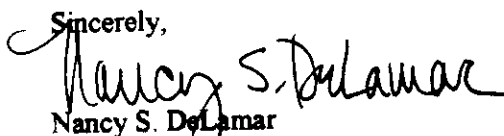
The ecological effects of converting 'natural' drainages to conduits and reservoirs are not adequately considered.

The potential effects of biocides, heavy metals and nutrients picked up by irrigation waters in the system, and moving into the White River National Wildlife Refuge are not considered.

Infestation by the zebra mussel is likely to make the project uneconomical to operate.

Thank you for the opportunity to provide these comments.

Sincerely,



Nancy S. DeLamar
Vice President and State Director
Arkansas Field Office
The Nature Conservancy

enclosure



Harold K. Grimmelt
Director

**ARKANSAS NATURAL HERITAGE COMMISSION
1500 TOWER BUILDING
323 CENTER STREET
LITTLE ROCK, ARKANSAS 72201**



Mike Huckabee
Governor

Date: September 21, 1998
Subject: Eastern Arkansas Region Comprehensive Study
Grand Prairie Area Demonstration Project
Draft General Reevaluation Report and
Environmental Impact Statement
ANHC No.: F-COEM-98-044

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Sir:

Staff members of the Arkansas Natural Heritage Commission (ANHC) have reviewed the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project, Draft General Reevaluation Report (GRR) and Environmental Impact Statement (EIS). We have the following comments about this project.

Canal and Pipeline Construction Impacts

Both (2) crossings of the ANHC Railroad Prairie Natural Area (please refer to the attached copy of Wetland Map 1-B, Volume 8 of the GRR) may result in conversions of use on lands bought with Land and Water Conservation funds and thus may require replacement. The Corps of Engineers (COE) should negotiate these issues with the National Parks Service and its representative, Arkansas State Parks. ANHC will participate as appropriate.

At the crossing site of the Railroad Prairie Natural Area east of Hazen (Wetland Map 1-B), a pipeline is shown leaving the canal and paralleling the south side of the Natural Area before crossing it toward the north. Impacts of this line would be significant, but could be avoided by having the line parallel the north side of the Natural Area.

Downs Prairie Registry Area (please refer to the attached copy of Wetland Map 1-C, Volume 8 of the GRR), although not identified by name, is crossed by a line. This appears to be a situation where the intent was to direct the line around the prairie, but layers in the CADD were not registered properly. This error should be corrected.

Fairmont Prairie is crossed by a canal (please refer to the attached copy of Wetland Map 3-B, Volume 8 of the GRR). We have previously requested that the canal be shifted to the other side of the county road here to avoid the prairie. If that shift is impossible, the loss of prairie should be mitigated.

At any place where prairies are crossed by the project, prairie sods should be removed to be used in restoration of the affected area or some other appropriate area.

Pipeline 1500.06 (please refer to the attached copy of Project Map 1-C, Volume 8 of the GRR) appears to cross a steep ravine. If so, is this avoidable?

Impacts of Water Withdrawals on White River Bottomland Forest and Wetlands, Including Cumulative Impacts

This agency participated in a study to examine impacts of water withdrawals on bottomland forest and wetlands (outside of the channel of White River). This study indicated that possibly significant reductions in flood flows would be caused by the project, but that these changes would be offset by artificially high flows from upstream releases from dams. Therefore, adverse impact would probably not be unacceptable. However, it is likely that any other major withdrawal of water from the White River would, in combination with those from this project, have major adverse impacts on hydrology and vegetation in the White River bottomlands. Therefore assessment of cumulative impact is warranted.

Impacts on Streams of the Grand Prairie

It is impossible for us to tell whether flow rates in natural watercourses will be appropriate to maintaining natural systems along these streams. Has an analysis of this been done?

The large number of weirs (120) constructed in natural waterways as a part of this project will have major adverse impacts. The direct impacts caused by clearing and filling in wetlands will be mitigated. However, it is impossible, from the data provided, to determine the effects of impoundment behind these weirs on riparian vegetation. We suggest that a multi-agency group be assembled to determine which weirs are likely to have adverse impacts, and determine whether the impacts can be reduced through relocating the weirs or through other means.

Prairie Restoration on Canal Rights-of-Way

Staff of ANHC have been closely involved in development of plans for planting native prairie species on canal rights of way (ROW). We consider this to be a major positive feature of the project, and will continue to assist in its planning and implementation. Several considerations were raised by the U.S. Fish and Wildlife Service in the Final Fish and Wildlife Coordination Report (Volume 9, Appendix C, Section VI of GRR), and in general we think they have merit. Specifically, the report supports revegetation of the ROW with prairie species as proposed (p. 31). We support the proposal to "Develop objective, quantitative criteria for the long term goals of prairie restoration, rather than evaluate the project based on initial effort, and monitor

restoration efforts." (P. 33). We do not agree that prairie restoration requires a minimum species richness of 50% of that in relict prairies (p. 29), but will be happy to try to develop meaningful criteria. We do agree that the goal should be establishment of the greatest diversity of species possible, and will direct ANHC efforts toward that goal.

We believe that the Coordination Report is in error when it states that "The Corps has proposed to obtain the remaining relict prairies through fee title purchase or conservation easement." (P. 30). Although this is a laudable goal and has been the goal of ANHC for many years (we have purchased fee or easements on 4 tracts), such a statement must be tempered by the qualifications that such purchases must only be from willing sellers and at a price related to fair market value. Any threat of condemnation will only result in alienation of the families that have protected the remaining tracts at personal financial sacrifice, and willingness to pay an inflated price for areas of high conservation value will ultimately prove self-defeating.

We agree with the Coordination Report that restored prairie in a linear strip along canal rights of way is less desirable than the same acreage in a block, however, the former approach is infinitely preferable to doing nothing. We do expect that there will be opportunities to widen the restored prairie along the ROW at various points using uneconomic tracts of adjacent land, and that points where the ROW is adjacent to or close to native prairie remnants will offer potentials for restoration in blocks and we will direct ANHC efforts toward accomplishing that.

Impacts to Grand Prairie Wetlands From On-Farm Construction

ANHC has noted increasing numbers of permit applications for building on-farm water facilities in naturally vegetated wetlands in the Grand Prairie region, and to some extent throughout eastern Arkansas. Construction of this project may increase this, and the planning process and impact assessment should account for this trend and try to minimize it through encouragement of water collection and storage facilities in prior converted wetlands, cropped uplands, or farmed wetlands. Landowners should be notified from the outset that they are responsible to comply with all requirements of Section 404 of PL 92-500. Consideration should be given to creation of one or mitigation bank sites in the Grand Prairie area to ensure that off-site mitigation is done most effectively. It may be appropriate in some cases to mitigate some farmed wetland loss with prairie wetland restoration rather than bottomland forest wetland restoration.

Federally Listed Species

Since we initially provided information to you on species of concern, an eagle nest has been recorded within the project area east of Stuttgart (please refer to attached data print-out for details on this occurrence). No canals or pipelines appear to be located near this nest.

General Concerns

It appears to us that too many of the key mitigating features of the project have been left as voluntary actions by the landowners. Unless the project actually results in recharge of the alluvial aquifer, it must be considered a failure. Such a measure of success should be included in the

project, and failure to meet that objective should result in financial penalties being imposed on the project sponsors. Such a measure could also be developed for individual tracts: unless use of groundwater is reduced, additional financial charges should be levied.

The opportunity to comment is appreciated.

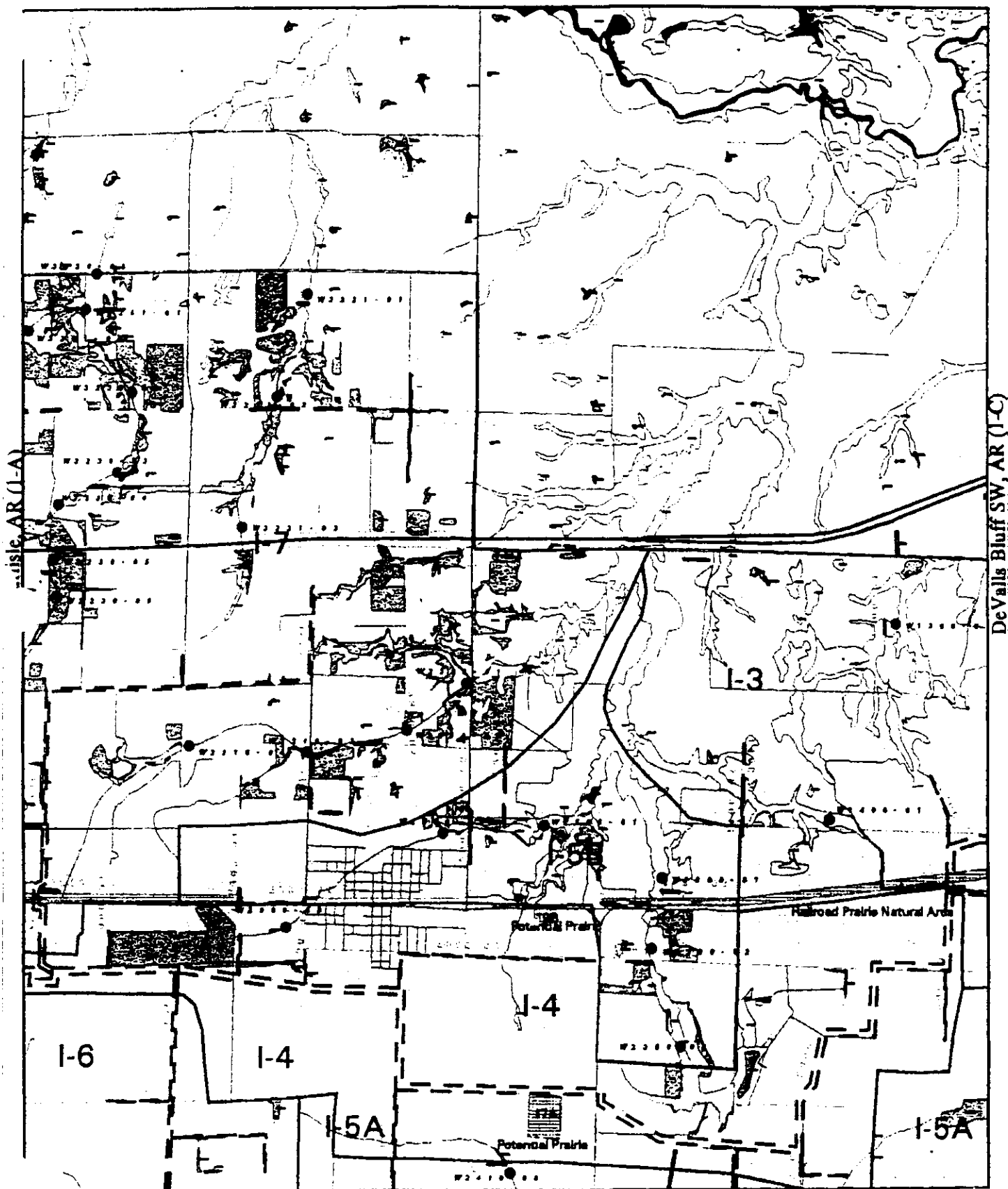
Sincerely,

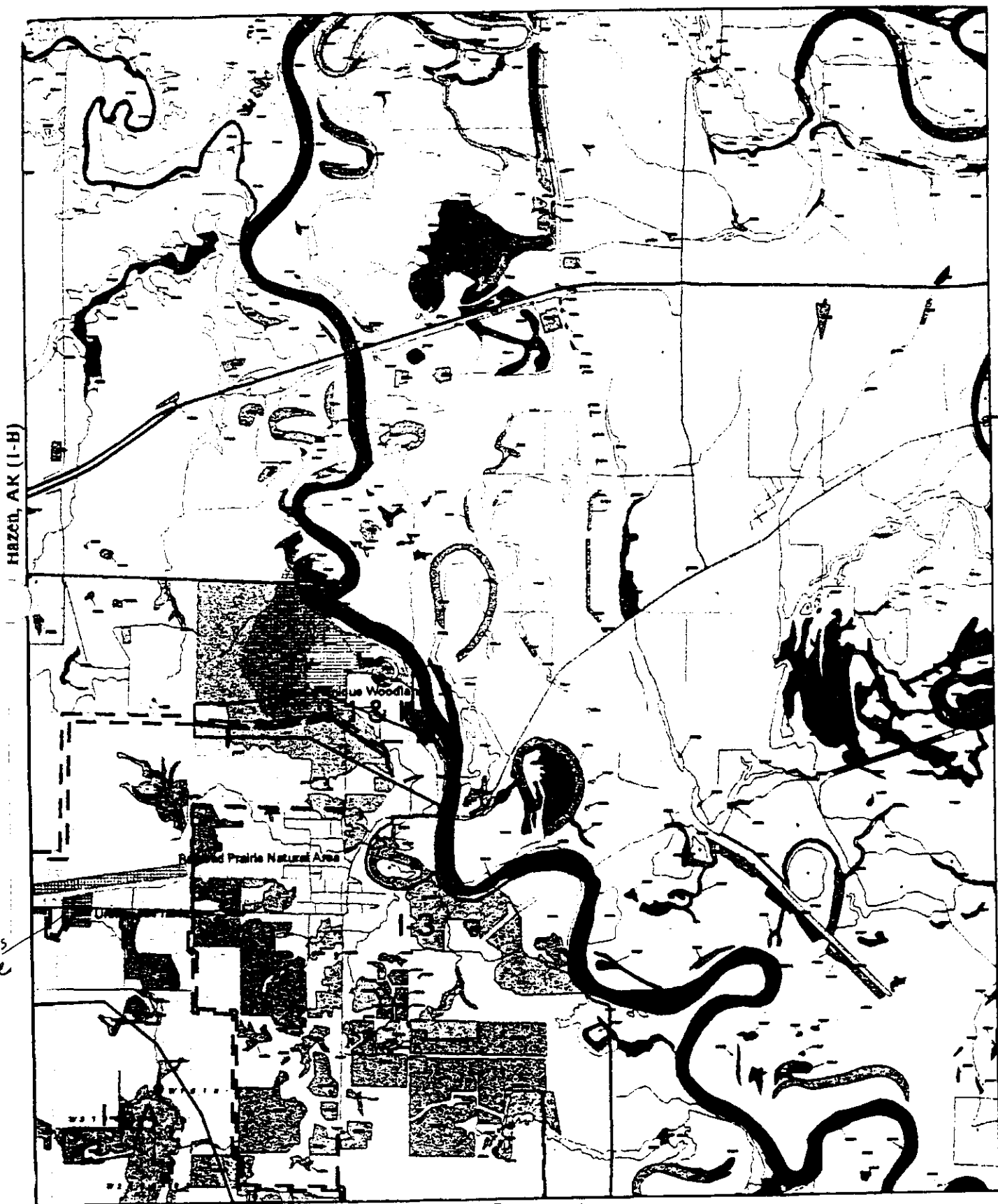
A handwritten signature in cursive script, appearing to read "Cindy Osborne".

Cindy Osborne
Data Manager

Enclosures: 4 maps

Print-out and map of Bald Eagle Occurrence Information





Hazen, AK (1-B)

Down's
Prairie

Le Wood

Prairie Natural Area

Roe, AR (2-C)



Devalls Bluff SW, AR (1-C)

Wetlands



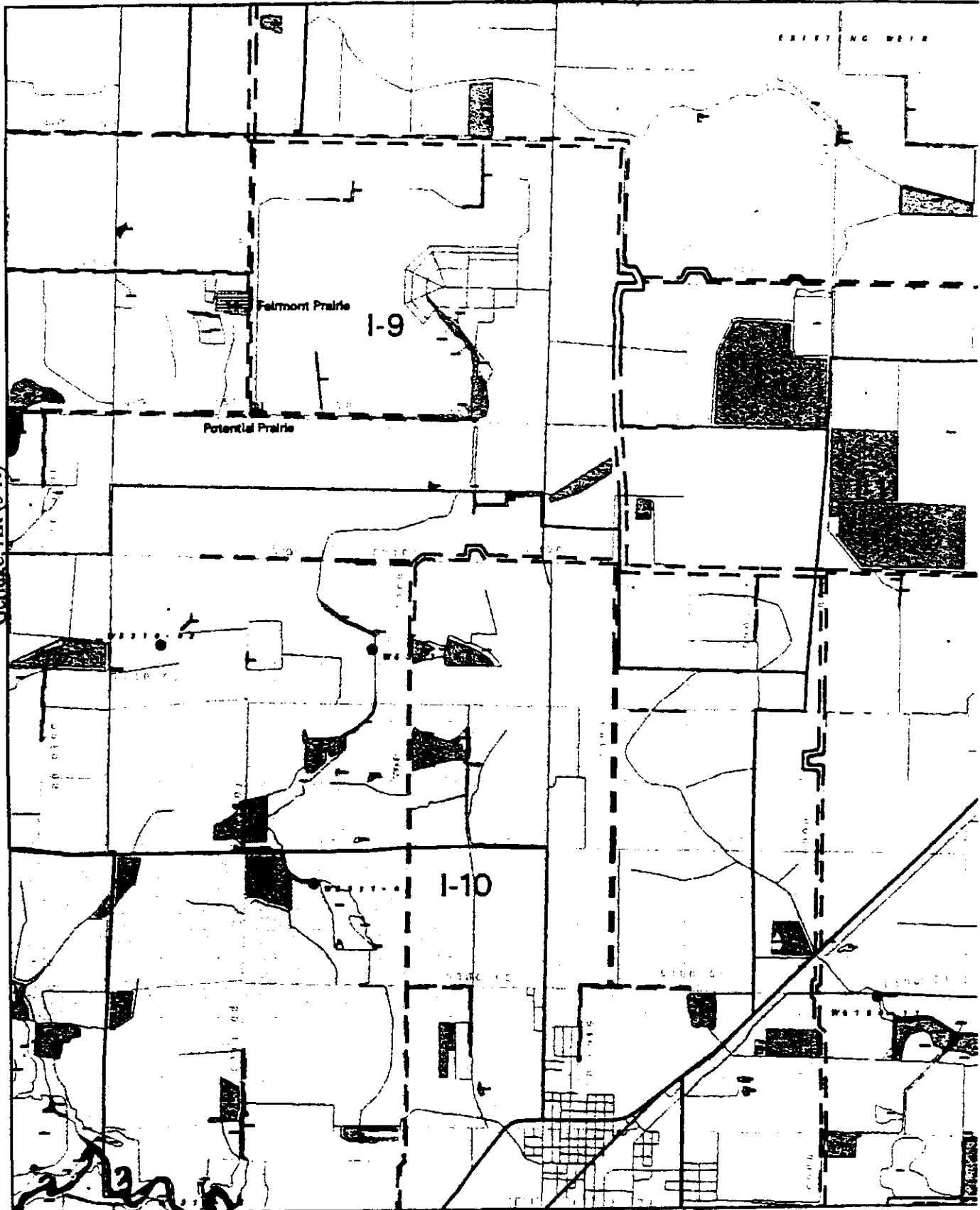
U.S. Army Corps
of Engineers
Mobile District



GROUND WATER INSTITUTE
The University of Arkansas

Slovak AR (2-B)

Geridge AR (3-A)



Stuttgart South, AR (4-B)

Stuttgart North, AR (3-B)

Wetlands



U.S. Army Corps of Engineers
Vicksburg District



NATIONAL WETLANDS INVENTORY
U.S. Department of the Interior



Element Occurrence Record

Identifiers

ANHC Identification Code: 92.006
Scientific Name: HALIAEETUS LEUCOCEPHALUS
Common Name: BALD EAGLE
Federal Status: THREATENED

Locators

County Name: ARKANSAS
U.S.G.S. Quad. Name: ULM 7.5
Township/Range: Section: Meridian:
T02S/R04W 16 5P

Directions:

HWY. 146 E. FROM ITS JCT. WITH HWY. 79, 4.25 MILES (1 MI. E. OF JOG IN HWY.) TO PRIVATE FARM RD. FOLLOW .5 MI. N. TO HOUSE OF OWNER. ACCES VIA LEVEES AROUND GREENTREE.

Occurrence Information

Last Observed Date: 1997-03-01

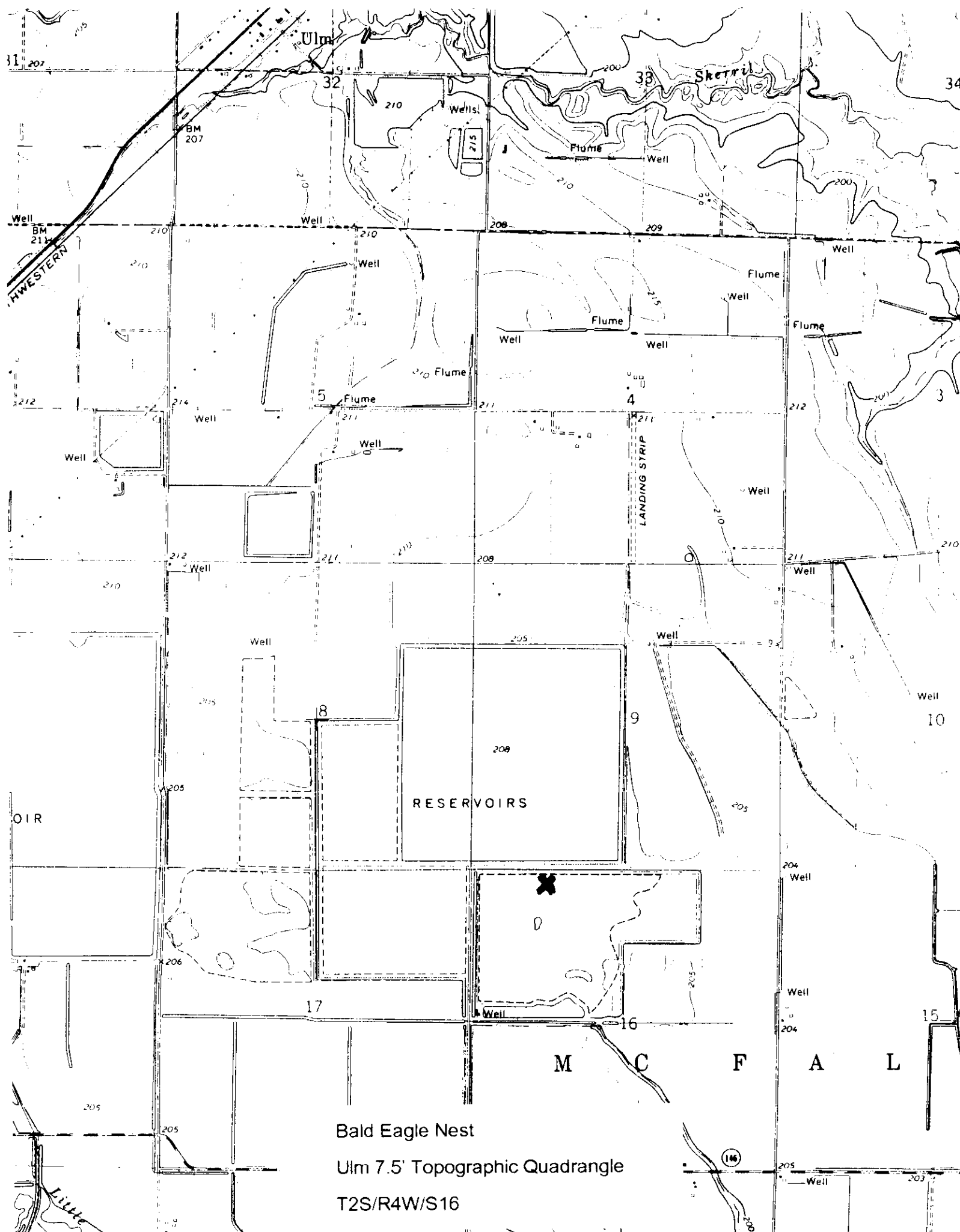
Element Data:

EAGLES OBSERVED ONNORTH CENTRAL EDGE OF GREENTREE RESERVOIR FACING OPEN WATER, BUT 200 FEET IN. LARGER BIRD FLEW AROUND REPEATEDLY CALLING, SMALLER BIRD SAT ON BRANCH, NEITHER WAS ON NEST.

General Description of Area of Occurrence:
GREENTREE RESERVOIR.

Source of Information

FOTI, T. 1997. FIELD NOTES & MAP FROM VISIT TO PROPOSED WETLAND EASEMENT AREA, 11 MARCH 1997.



Bald Eagle Nest

Ulm 7.5' Topographic Quadrangle

T2S/R4W/S16

ARKANSAS STATE HIGHWAY COMMISSION



BOBBY HOPPER, CHAIRMAN
SPRINGDALE

HERBY BRANSCUM, JR., VICE CHAIRMAN
PERRYVILLE

JOHN "M" LIPTON
WARREN

P. O. Box 2261
LITTLE ROCK, ARKANSAS 72203-2261
TELEPHONE No. (501) 569-2000
FAX No. (501) 569-2400

J.W. "BUDDY" BENAFIELD
NEWPORT

MARY P. "PRISSY" HICKERSON
TEXARKANA

DAN FLOWERS
DIRECTOR OF
HIGHWAYS AND TRANSPORTATION

September 21, 1998

Commander
Memphis District Corps of Engineers
Attention: CEMVM-PD-R
167 North Main Street, B-202
Memphis, Tennessee 38103-1894

Re: Eastern Arkansas Region Comprehensive Study
Grand Prairie Area Demonstration Project
Draft General Reevaluation Report and
Environmental Impact Statement

Dear Commander:

The Arkansas State Highway and Transportation Department (AHTD) has reviewed the proposed Grand Prairie Area Demonstration Project proposal. The scale of this project will impact numerous roads and bridges within the Department's right-of-way. There will be thirteen (13) bridges, one-hundred and eighty-nine (189) concrete box culverts and two-hundred and sixty (260) pipe culverts to be constructed across various county, state and federal highways. Of those numbers, forty-nine (49) concrete box culverts and thirty-five (35) pipe culverts will be placed under state and federal highways. As reviewed in Volume 8, Appendix B, Engineering Investigations and Analyses, Section VII-Reference maps, these structures are located in a variety of locations. The study also states that "bridges will be designed according to Arkansas State Highway Standards and will meet HS-20 live loadings."

Concerns that need to be addressed in the project's preconstruction phase are:

- The water intake facility near the new White River Bridge at DeValls Bluff will need an access road. This access is shown in the curve of the newly realigned U. S. Highway 70. Construction of the access road will require right-of-way easements and construction upon these easements. The intake canal and pump facility could present navigational problems at the new bridge during and after construction. Questions that arise in this location are: Will the Corps of Engineers remove the existing railroad truss bridge? Will the construction of the intake have any impacts upon the new highway bridge such as deposition, scouring or navigation?

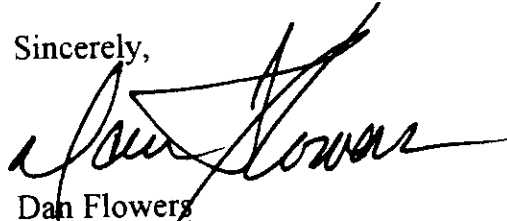
ARKANSAS STATE HIGHWAY COMMISSION
LITTLE ROCK, ARKANSAS

Memphis District Corps of Engineers
Page Two

- Volume 9, Appendix C, Environmental, page II-3, 1, states "Environmental review of canal/pipeline alignment identified several opportunities to relocate these items into road rights-of-way or open land to minimize habitat losses." If the Corps plans to implement such a plan, coordination and permitting from AHTD and Federal Highway Administration will be needed. AHTD plans to widen selected Federal and State Highways within the project area. It is suggested that the Corps of Engineers initiate early coordination with AHTD to identify, modify, design and construct water conveyance structures to meet AHTD and Corps specifications. Detailed coordination between our two agencies is desirable to ensure a smooth transition with decreased costs to the taxpayers.

The Arkansas State Highway and Transportation Department thanks the Corps of Engineers for the opportunity to address its concerns for the above project. Any further questions or comments can be addressed to the Department at the above address.

Sincerely,

A handwritten signature in black ink, appearing to read "Dan Flowers", written over a horizontal line.

Dan Flowers
Director of Highways
and Transportation

cc: Chief Engineer

September 17, 1998

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PD-R
167 North Main Street, B-202
Memphis, TN 38103-1894

Re: Eastern Arkansas Region Comprehensive Study,
Grand Prairie Area Demonstration Project,
Draft General Reevaluation Report and Environmental Impact Statement

After reading your Draft EIS, Environmental Comments and Appendices, I have concerns for the project. These concerns are:

- 1) The EIS mentions that 38,525 acres of rice and agricultural fields will be flooded to enhance winter water for waterfowl. This is admirable and needs to be implemented in the project. My question is: Who will get to hunt these waterfowl, the general public or just those individuals privileged enough to own the land? 270,000,000 dollars is a lot for a few hundred hunters to enjoy and enhance their hunting. If there is such a large amount of acreage to be enhanced with winter water, could not some of the land be used for waterfowl rest areas. Even moist soil management areas could be used by migratory shorebirds. This would keep waterfowl in the area and decrease the likelihood that waterfowl would be burned out of the area. But nowhere in your documents do you mention specific rest areas for waterfowl. This would be a small price to pay for such an ambitious project.
- 2) Your documents note that the project will enhance project sloughs and bayous. I do agree that these streams would be improved with water catching weirs. I agree that the aquatics, benthics and fisheries of these sloughs would be vastly improved. But again my question is: Will the public be allowed to fish these waterways? Who will have access to these fisheries and what other activities will be allowed on these waters?
- 3) In Volume 9, Section 1, part II-08, Table 1, Screening of Mitigation alternatives, the COE says "Development of Public lands within the study area is deleted", because "Within the Wattensaw WMA, even extremely intensive management would not produce the needed management credits. There is hardly any cleared bottomland that would be suitable for bottomland hardwood restoration. Each refuge contains only a limited amount of prior-converted and/or farmed wetland that would be suitable for bottomland hardwood restoration. Also, since most of the refuge lands are typical bottomlands, sites would not be available for upland hardwood restoration." My question to this statement is where are you looking? There are several areas along the White River flood plain that would make excellent bottomland hardwood restoration areas. Several farmed wetland areas around Wattensaw would make an excellent candidate. You do mention that bottomland hardwoods would be planted, where? This is not a big question. Most wetland projects are required to have these lands available before such a project can be implemented. Again, I ask where is this mitigation land going to be located?

4) A comprehensive environmental analysis to assess changes in the water quality, turbidity and chemical load from herbicides, pesticides and other agricultural chemicals are suggested before the project is initiated. The section on hazardous materials in the region and its impacts upon this study were weak. Your report did note several water chemistry parameters but this only looked at the present situation. The study did not predict the impact of taking good quality White River water and the impact the heavily agricultural usage area will have upon this water, before it is returned to the White River. There are several studies about agricultural runoffs and toxic level buildups of heavy metals (lead, copper, chromium, selenium, silver, aluminum) and increased levels of residual agricultural chemicals. Does the COE plan to address these environmental issues before the project is started?

5) Pumping water from the White River will introduce zebra mussels into local streams, lakes and tributaries of the White River. The zebra mussel will definitely have an impact upon the pumps, weirs and water control structures of this project. So get ready.

6) The biggest concern I have for the project is the cumulative impact. This demonstration project is just that. It will demonstrate that water removed from the river can and will be used for irrigation. But the EIS does not take into account the cumulative impacts for all five irrigation projects that will be implemented if this project is a success. It would be nice to know how much water in cubic feet per second will be removed from the river for all five projects. With the building of the Montgomery Point Lock and Dam, the need for a deeper navigation channel and dams on the upper reaches of the river the designation to RAMSAR as a river ecosystem of international importance is diminished. This project warrants and needs a basin wide investigation of impacts caused by current and future Corp of Engineers projects.

At this time I can only support Alternative 3, Conservation With Storage. This alternative maximizes the use of existing water sources to the extent practical. It promotes increased efficiency and usage of irrigation water, construction of new reservoirs and is the most cost effective method for irrigation. Alternative 3 yields a higher dollar return for each dollar invested. I know this does not address the dwindling groundwater problems but it would give enough time to access the impacts of all five irrigation projects, the Montgomery Point Lock and Dam and the proposed navigation project upon the White River Basin. This EIS is only looking at the narrow picture, the bigger picture is when you back up and look at all its impacts.

I want to thank the Corp of Engineers for the opportunity to address its concerns for the above project. Any further questions or comments can be addressed to :



Terry W. Tucker
2957 West Country Club Road
Searcy, AR 72143



ARKANSAS
HISTORIC
PRESERVATION
PROGRAM

October 9, 1998

Mr. Donald M. Dunn, P.E.
Acting Chief, Planning Division
Department of the Army
Memphis District, Corps of Engineers
167 North Main Street, B-202
Memphis, Tennessee 38103-1894

RE: Multi County - General
Section 106 Review - COE
Report Entitled "Eastern Arkansas Region Comprehensive Study,
Grand Prairie Area Demonstration Project, Draft General Reevaluation
Report, and Environmental Impact Statement"

Dear Mr. Dunn:

My staff has reviewed the referenced report for the proposed agricultural water supply, conservation, and groundwater preservation program for eastern Arkansas. We concur with your decision to conduct a cultural resources survey, and do National Register eligibility evaluations on historic properties in the project area. We further agree that significant cultural resources should be avoided and protected or mitigated by archeological data recovery.

Thank you for your interest and concern for the cultural heritage of Arkansas. We can proceed with our review upon receipt of the cultural resources survey report.

If you have any questions, please contact George McCluskey of my staff at (501) 324-9880.

Sincerely,

Cathy Buford Slater
State Historic Preservation Officer

CBS:GM

cc: Arkansas Archeological Survey



4. The research design for the other historic archeological sites is acceptable. However, we do recommend that special attention be paid to site 3PR84, the Civil War site at De Valls Bluff. This site is eligible for inclusion in the National Register of Historic Places, and could possibly qualify as a National Historic Landmark. We recommend avoidance and protection for this historic property.
5. All standing structures, bridges, and objects which are 50 years old or older should be documented with Arkansas Historic Preservation Program architectural resource forms. In addition, black and white photographs and color slides should be taken of all such resources.

Thank you for your interest and concern for the cultural heritage of Arkansas. We look forward to reviewing the next phase of research on this project.

If you have any questions, please contact George McCluskey of my staff at (501) 324-9880.

Sincerely,

A handwritten signature in cursive script, reading "Cathy Slater".

Cathy Buford Slater
State Historic Preservation Officer

CBS:GM

cc: Prentice Thomas and Associates, Inc.
Arkansas Archeological Survey



IN REPLY REFER TO

United States Department of the Interior

FISH AND WILDLIFE SERVICE

1875 Century Boulevard
Atlanta, Georgia 30345
November 18, 1998

Colonel Daniel W. Krueger
District Engineer
U.S. Army Corps of Engineers
167 North Main St., Room B202
Memphis, Tennessee 38103-1894

Dear Colonel Krueger:

In an October 5, 1998 letter, the Fish and Wildlife Service (Service) commented on the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project (GPADP) draft General Reevaluation Report (GRR) and Environmental Impact Statement. The Service is concerned about the voluntary nature of most of the project features and the cumulative impacts the GPADP and other projects could have on the White River basin. Therefore, the Service is submitting these additional comments.

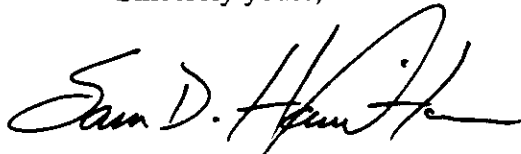
The GPADP is a proposed Memphis District Corps of Engineers (Corps) project plan for ground water protection and conservation, agricultural water supply, and waterfowl management, as well as other related improvements for the Grand Prairie region in east central Arkansas. However, many of the features the Service considers essential to the GPADP, such as on-farm water storage, water conservation, wetland avoidance, and creation of winter waterfowl habitat by flooding agricultural fields, are identified as voluntary actions to be implemented by the local agricultural interests. Much of the project data is based on the assumption that the majority of the local farmers will implement these features. We do not agree with this assumption, and have recommended that these voluntary parts of the project be made mandatory.

The Service feels strongly that the cumulative impacts of all projects involving the White River should be addressed in detail. Of the five irrigation projects being evaluated for this area four of them would directly or indirectly impact the White River. The proposed Grand Prairie and White River projects would pull water directly from the White River, while the Little Red and Black River projects would pull water from its tributaries. The demands of navigation, agricultural irrigation, and regulated flow releases from the reservoirs all combine to place an inordinate amount of strain on the river's hydrologic features and the network of interrelated biological systems that rely on them. If not properly monitored and controlled, the demands for water from the river system could, at the very least, adversely impact its fisheries, riparian habitat, oxbows, bottomland hardwoods, and the wildlife which depend upon them. These systems rely heavily on the rivers seasonal flood regime and if the demands for water from the river are such that this pattern is disrupted there would be serious impacts to all these natural systems.

This section of the White River is part of the largest remaining contiguous bottomland hardwood area in the Mississippi Alluvial Valley. It supports the White River and Cache River National Wildlife Refuges which make up part of a Ramsar identified wetland of international importance. Wetlands selected for inclusion on the List of Wetlands of International Importance are listed based on "international significance in terms of ecology, botany, zoology, limnology or hydrology." The Ramsar Convention included the White River area because it exemplifies a specific wetland type characteristic of its region, the quality and peculiarities of its flora, and because it supports substantial numbers of waterfowl and other valuable species. There are only fifteen Ramsar identified wetland areas in the United States.

Because of the international importance of White River basin, its unique environmental features, and the great potential for adverse impacts from this and other currently proposed projects we feel referral of this project to the CEQ may be required. Therefore, although we will continue to work toward an acceptable resolution of all issues, the Department of the Interior does not exclude the possibility of exercising its option for further action as provided for under the Council on Environmental Quality's NEPA regulations (Ref: 40 CFR, Section 1504).

Sincerely yours,



Sam D. Hamilton
Regional Director



Reply to
Attention of:

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT CORPS OF ENGINEERS
167 NORTH MAIN STREET B-202
MEMPHIS TN 38103-1894

EASTERN ARKANSAS REGION COMPREHENSIVE STUDY

GRAND PRAIRIE AREA DEMONSTRATION PROJECT

GENERAL REEVALUATION REPORT (GRR) AND FINAL ENVIRONMENTAL IMPACT STATEMENT

SEPTEMBER 1999

**EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY**

**GRAND PRAIRIE AREA
DEMONSTRATION PROJECT**

GENERAL REEVALUATION REPORT

MAIN REPORT

GRAND PRAIRIE AREA DEMONSTRATION PROJECT GENERAL REEVALUATION REPORT (GRR) SYLLABUS

The Grand Prairie Area Demonstration Project general reevaluation was conducted in response to Congressional direction, contained initially in the Energy and Water Development Appropriations Act of 1992, which directed the Secretary of the Army to develop implementation plans for one of the areas identified in the Eastern Arkansas Region Comprehensive Study to serve as a demonstration project for agricultural water supply, groundwater management and conservation. This report summarizes the study findings and results and describes the selected plan of improvement for the demonstration area.

The purpose of this study is to determine the engineering, economic, and environmental feasibility of plans for groundwater protection and conservation, agricultural water supply, and waterfowl management and related improvements for the Grand Prairie region in east central Arkansas.

Water is one of Arkansas' most valuable resources and its protection and conservation are of paramount importance. The agricultural economy, which supports the eastern Arkansas region, cannot exist without a dependable supply of irrigation water. Continued withdrawals at the current rate will deplete the alluvial aquifer such that by the year 2015 it will no longer be a viable source of irrigation water; and agriculture, as it is now practiced, will be impossible. The economic results of exhausting the aquifer would be catastrophic.

After identifying the problems and opportunities and assessing and evaluating the potential solutions in coordination with local interests, the selected plan is the combination of measures: conservation, groundwater, on-farm storage, import water, and environmental features which best meet the needs of the project area and is the preferred plan of the potential project sponsor. The selected plan provides a supplemental source of irrigation water with conservation which allows the alluvial aquifer to stabilize.

Pertinent economic data for the selected plan for the current interest rate of 7.375 percent and a 50 year project life are as follows:

Estimated First Cost (Oct 96 Price Level)	\$270,512,000
Estimated Average Annual Costs	\$ 29,256,000
Estimated Average Annual Benefits	\$ 36,132,000
Benefit-to-Cost Ratio	1.2

Included in the annual cost is \$12,000 in potential induced flood damages on existing streams which are used as a part of the distribution system and \$127,000 for impacts to navigation on the White River. The average annual operation, maintenance, replacement, repair, and rehabilitation (OMRR&R) costs are estimated to be \$4,639,000.

The requirements of Section 404(r) of Public Law 92-500, as amended, have been met.

The Water Resources Development Act (WRDA) of 1996 reauthorized the Grand Prairie Region and Bayou Meto Basin, Arkansas Project to include groundwater protection and conservation, agricultural water supply, and waterfowl management.

The recommendation is that this draft general reevaluation report (GRR) be approved as the basis for proceeding to the development of design memoranda, as needed, preparation of plans and specifications and subsequent project construction of the Grand Prairie separable element of the Grand Prairie Region and Bayou Meto Basin, Arkansas Project in accordance with cost-sharing and financing arrangements satisfactory to the President and Congress.

The project as described in the draft GRR is designed for the purpose of agricultural water supply and conservation and groundwater preservation. The Water Resources Development Act of 1996 (WRDA'96) authorized the project as a multiple purpose project. To comply with WRDA'96, the project will be studied for revisions to produce substantial additional groundwater protection and waterfowl conservation benefits. The resulting report from that study will be considered by the Secretary of the Army, who will decide whether the revisions should be included in the project.

GRAND PRAIRIE AREA DEMONSTRATION PROJECT

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GRAND PRAIRIE AREA DEMONSTRATION PROJECT GENERAL REEVALUATION REPORT (GRR)

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INTRODUCTION

This report is a cooperative effort of Federal, state, and local agencies to address the declining groundwater resources in the Grand Prairie area of eastern Arkansas. The report is presented in 12 volumes. **Volume 1**, which includes the main report and the final environmental impact statement (FEIS), is a nontechnical presentation of the study results, including a broad overview of the overall project history and formulation process, the FEIS, and study recommendations. The remaining volumes are as follows:

Volume 2

Appendix A: Natural Resources Conservation Service (NRCS) On-Farm Report

Section I: Natural Resources Plan For On-Farm Portion

Section II: Documentation Report

Volume 3

Appendix B: Engineering Investigations & Analyses

Section I: Hydraulics and Hydrology

Volume 4

Appendix B: Engineering Investigations & Analyses

Section II: Geology & Soils

Volume 5

Appendix B: Engineering Investigations & Analyses

Section III: General Engineering

Section IV: Structural, Electrical & Mechanical

Volume 6

Appendix B: Engineering Investigations & Analyses

Section V: Major Pumping Station

Volume 7

Appendix B: Engineering Investigations & Analyses

Section VI: Cost Engineering Report

Volume 8

Appendix B: Engineering Investigations & Analyses

Section VII: Reference Maps

Volume 9

Appendix C: Environmental

Section I: Habitat Evaluation System (HES) Analysis

Section II: Mitigation & Environmental Features

Section III: Water Quality

Section IV: Section 404(b)(1) Evaluation

Section V: Fisheries

Section VI: Coordination

Section VII: Habitat Maps

Section VIII: Cultural Resources

Section IX: Hazardous, Toxic, and Radioactive Waste

Volume 10

Appendix D: Economics

Section I: Optimization of Project Features

Section II: Import System Optimization

Section III: Optimization of On-Farm Features and White River Withdrawals

Appendix E: Real Estate

Volume 11

Appendix F: Legal & Institutional Studies

Section I: Institutional and Legal Aspects of Project Development and Implementation -
Summary and Recommendations

Section II: Institutional and Legal Aspects of Project Development and Implementation

Section III: Legal and Institutional Barriers That Remain to Project Development and
Implementation

Volume 12

Appendix G: Quality Control Plan & QC/QA Documentation

AUTHORITY

HISTORY

Section 204 of the Flood Control Act of 1950 (64 Stat 174) authorized a project for the Grand Prairie Region and the Bayou Meto Basin in eastern Arkansas. Due to a lack of local sponsorship, this project was never funded and was subsequently deauthorized by Section 1001(B) of the Water Resources Development Act of 1986 (33 U.S.C. 579A(B)). However, removal of rice production limits, a severe drought in 1980, and a renewed concern for declining groundwater levels prompted interest in developing water conservation and supply projects.

STUDY

Responding to the concerns of state agencies, local officials, and individuals; the Committee on Public Works and Transportation of the United States House of Representatives adopted a resolution on 23 September 1982 which directed the Corps of Engineers to study the feasibility of developing water conservations and water supply project in eastern Arkansas. The resolution, sponsored by former Congressman Bill Alexander, is quoted as follows:

“Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on the Mississippi River and Tributaries Project, published as House Document Numbered 308, 88th Congress, and other pertinent reports, with a view to determining whether any modification of the recommendations contained therein are advisable at this time, with particular reference to the need and feasibility of improvements in the Bayou Meto, L’Anguille, St. Francis, Cache, and Lower White River Basins including their tributaries in the Alluvial Valley of Eastern Arkansas, in the interest of water conservation and water supply of both surface and subsurface water for municipal, industrial and agricultural purposes. These investigations will be fully coordinated with the State of Arkansas, appropriate local government entities, and interested Federal agencies.”

As a result of this legislation, the Corps of Engineers conducted the *Eastern Arkansas Region Comprehensive Study*, which identified five potential project areas. The Grand Prairie Area was included as one of these project areas. The final report was published in August, 1990.

GENERAL REEVALUATION

The Energy and Water Development Appropriations Act of 1992 directed the Corps of Engineers to continue the *Eastern Arkansas Region Comprehensive Study* and to “select and develop implementation plans for one area to serve as a demonstration project. The language is quoted as follows:

“Eastern Arkansas Region Comprehensive Study, Arkansas.--The bill includes \$420,000 for the Corps of Engineers to continue preconstruction engineering and design of the Eastern Arkansas Region Comprehensive Study authorized by the Committee on Public Works and Transportation of the House of Representatives on September 23, 1982. The Committee expects the Corps to use the funds to refine plans for agricultural water supply, groundwater management and conservation for the Grand Prairie, White River, Little Red River, Bayou Meto and Cross, Craighead, Poinsett, Jackson, St. Francis, Lee and Woodruff County areas in Arkansas. Further, the Committee directs the Secretary of the Army to select and develop implementation plans for one area to serve as a demonstration project.

The Grand Prairie area was selected for the demonstration project and a general reevaluation was initiated with development of an initial project management plan. Congressional direction and funding continued in the 1993, 1994, and 1995 Appropriations Acts. Funds were included in the FY 1996 and FY 1997 budgets to continue and complete the general reevaluation.

PROJECT REAUTHORIZATION

In 1996, Congress reauthorized the original Grand Prairie Region and Bayou Meto Basin flood control project with a broadened scope of work. Section 363(a), Project Reauthorizations, of the Water Resources Development Act (WRDA) of 1996, Public Law 104-303, is quoted as follows:

“Grand Prairie Region and Bayou Meto Basin, Arkansas.--The project for flood control, Grand Prairie Region and Bayou Meto Basin, Arkansas, authorized by section 204 of the Flood Control Act of 1950 (64 Stat. 174) and deauthorized pursuant to section 1001(b) of the Water Resources Development Act of 1986 (33 U.S.C. 579a(b)), is authorized to be carried out by the Secretary; except that the scope of the project includes ground water protection and conservation, agricultural water supply, and waterfowl management if the Secretary determines that the change in the scope of the project is technically sound, environmentally acceptable, and economic, as applicable.

This document presents the selected project implementation plan for the Grand Prairie Region. The Bayou Meto Basin will be addressed in a separate document.

STUDY PURPOSE AND SCOPE

The Appropriations Acts of FY92, FY93, FY94, and FY95 included funding for the Corps to continue preconstruction engineering and design (PED) studies and directed the Secretary of the Army “to select and develop implementation plans for one area to serve as a demonstration project.” Special instructions received from HQUSACE with the work allowances were:

- ❖ Initiate PED by preparing a general reevaluation report for one area to ultimately be used as a demonstration project site for agricultural water supply
- ❖ Submit report to Headquarters for review
- ❖ No commitment to future actions is to be made
- ❖ The demonstration project shall be the most cost effective plan, be engineeringly feasible, environmentally acceptable, and economically feasible
- ❖ Report progress monthly through the LCPM process

The purpose of the general reevaluation is to develop plans of improvement that address all of the identified water resources problems and opportunities within the Grand Prairie project area. Furthermore, the general reevaluation was conducted to fully evaluate and determine the optimum plan of improvement for providing agricultural water supply and conservation measures while incorporating water quality, fish and wildlife, recreation, and environmental protection/restoration measures. Based on the planning criteria, alternatives were developed and analyzed to the extent required to identify the plan consisting of measures that best meets the area’s needs. Once the plan was identified, detailed engineering and design studies were completed to the level of detail required for preparation of a baseline cost estimate and schedule for implementation.

REPORT AND STUDY PROCESS

REPORT

This report, which includes the final environmental impact statement (FEIS) and appendices, has been prepared in response to the referenced authorities and guidance. The general reevaluation report (GRR) is a complete decision document that provides a presentation of the study findings and results and describes the detailed plan of improvement for the demonstration area. This document is of sufficient detail and content to serve as the basis for proceeding to design memoranda, as needed, and plans and specifications for project construction.

The GRR and DEIS were coordinated with Federal, state, and local agencies and other interests for review and comment. Public meetings were conducted to discuss the study findings, conclusions, and report recommendations. Comments from the public review have been addressed and necessary revisions to the report have been made.

STUDY PROCESS

The first major milestone of the general reevaluation effort was completion of an Initial Project Management Plan (IPMP). This document, developed in close coordination with local interests, provided a detailed scope of study that outlined the specific tasks required by each organization and the corresponding resource requirements for their execution. Open Plan software was utilized to schedule activities, monitor milestones, and program and allocate monetary and personnel resources to the study effort. The first phase of the general reevaluation included all data collection and analyses necessary for identification of the best plan of improvement. The second phase consisted of detailed planning, engineering, and design studies required for preparation of the baseline cost estimate and schedule for implementation.

The next step is the review, processing, and coordination of the final GRR and DEIS. Preparation of plans and specifications for the first item of work will begin after the public notice is issued by the President, Mississippi River Commission and funds are provided by Headquarters, U. S. Army Corps of Engineers.

PRIOR STUDIES, REPORTS, AND PROJECTS

STUDIES AND REPORTS

The following studies, integral to development of the Grand Prairie Area Demonstration Project, were conducted during the reconnaissance or feasibility phase of the Eastern Arkansas Region Comprehensive Study or during the general reevaluation effort. Detailed discussions of the analyses and results are presented throughout the general reevaluation report (GRR) in specific sections to which they are related.

Geohydrologic and Conservation Studies for Eastern Arkansas Region Comprehensive Study, Memphis State University, January 1985.

Potential Conjunctive Water Resources Use Plan for the Grand Prairie Region of Eastern Arkansas, University of Arkansas, April 1985.

Eastern Arkansas Region Comprehensive Study - Present and Projected Land and Water Use, Soil Conservation Service.

Optimal Conjunctive Use-Sustained Yield Pumping Analysis for Eastern Arkansas, University of Arkansas, August 1988.

Simulation of Ground-Water Flow in the Mississippi River Valley Alluvial Aquifer in Eastern Arkansas, U. S. Geological Survey, 1990.

Trends and Comparison of Water Quality and Bottom Material of Northeastern Arkansas Streams 1974-85, and Effects of Planned Diversions, U. S. Geological Survey, 1990.

Development of a Groundwater Flow Model with Predictive Solutions for Grand Prairie Project Implementation, Ground Water Institute - University of Memphis, July 1995.

Grand Prairie Area Demonstration Project, Institutional and Legal Aspects of Project Development and Implementation, University of Arkansas, November 1994.

The Legal and Institutional Barriers That Remain to Project Development and Implementation, University of Arkansas, October 1996.

Eastern Arkansas Ground Water Quality Assessment, Ground Water Institute - University of Memphis, February 1997.

Effects of Grand Prairie Irrigation Project on Fishes of the White River And Delta Tributaries, Waterways Experiment Station - Corps of Engineers, February 1997.

OTHER PERTINENT REPORTS ON WATER SUPPLY IN EASTERN ARKANSAS

Numerous studies and reports concerning water supply and groundwater depletion in eastern Arkansas have been conducted by Federal, state and local agencies, research institutions and individuals. Many of these studies were researched for background and historical information during conduct of the Eastern Arkansas Region Comprehensive Study and the Grand Prairie Area Demonstration Project General Reevaluation and were the source for much data.

House Document No. 255, 81st Congress, 1st Session, *White and Arkansas Rivers and Tributaries, Grand Prairie Region, Arkansas*, July 1949.

House Document No. 308, 88th Congress, 2nd Session, *Mississippi River and Tributaries, Grand Prairie Region and Bayou Meto Basin, Arkansas*, Annex P, October 1959.

PLAN FORMULATION

Plan formulation is the design of alternative plans that will meet planning objectives. An alternative plan consists of a system of structural and/or nonstructural measures, strategies, or programs formulated to alleviate specific problems or to take advantage of specific opportunities associated with water and related land resources. This section includes a description of the problems, needs, and opportunities; a description of current and future conditions pertinent to the proposed project area; and a presentation of the development, evaluation, and screening of alternative plans of improvement.

PROBLEMS AND OPPORTUNITIES

EXISTING CONDITIONS

Existing conditions pertinent to this study are those physical and socioeconomic conditions related to agricultural water supply and the environment and those associated with impacts of the alternative plans developed to address identified problems and opportunities.

PHYSICAL CONDITIONS

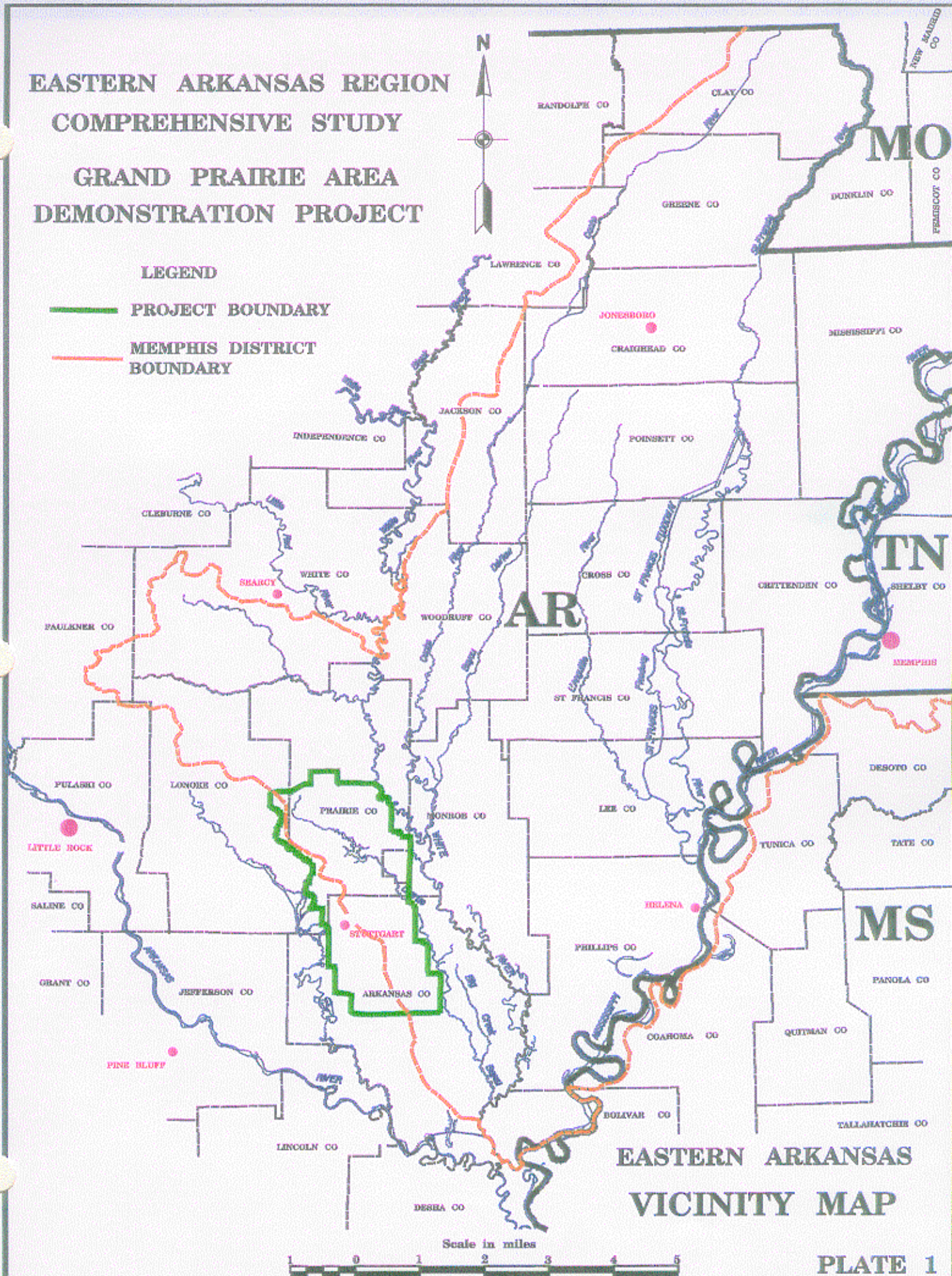
This section provides a description of the existing physical characteristics of the land and water resources within the project area.

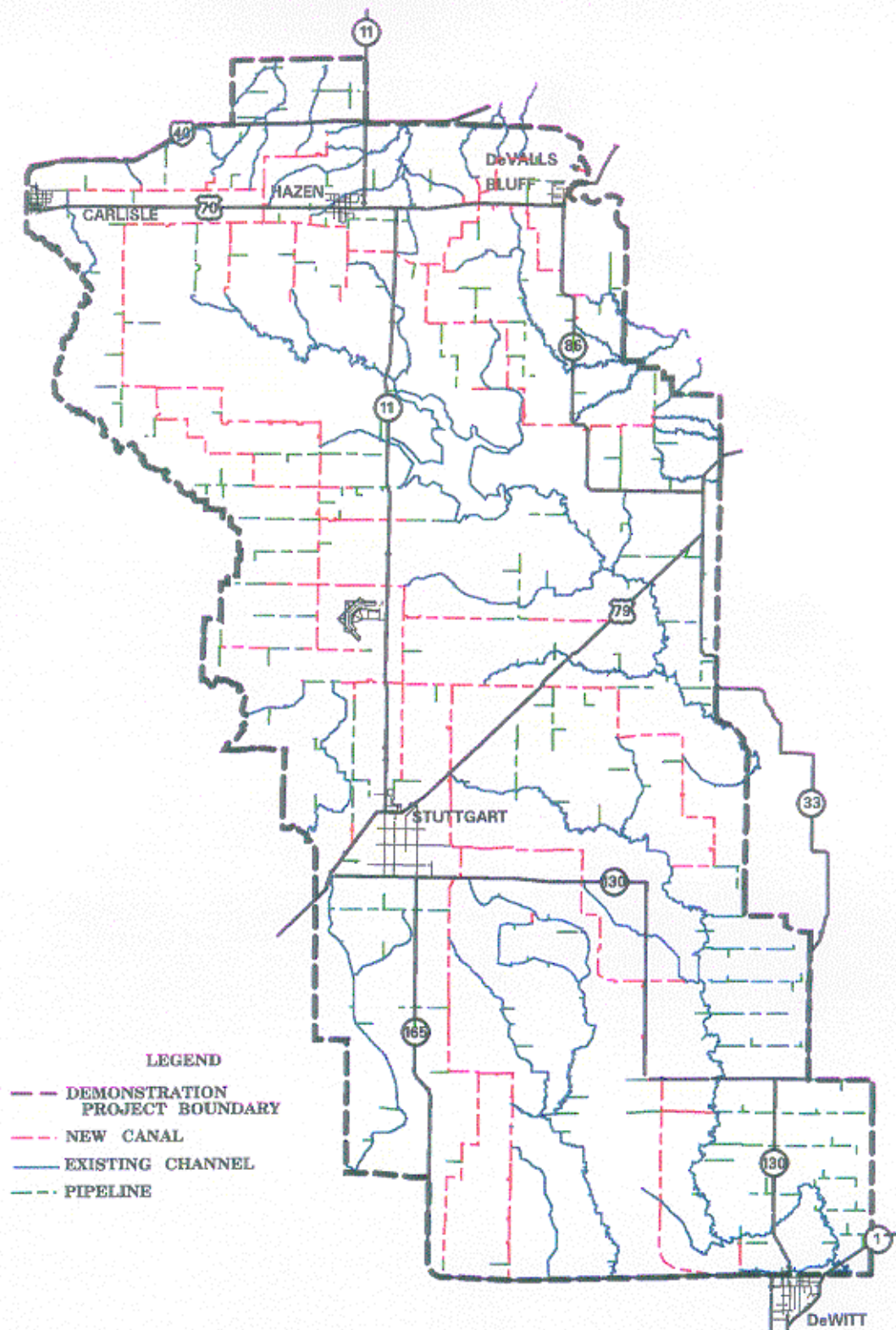
STUDY AREA

The Grand Prairie Demonstration Project Area as shown on Plates 1 and 2 includes portions of Arkansas, Prairie, Lonoke, and Monroe counties in east central Arkansas. The area encompasses 362,662 acres located between the White and Arkansas Rivers and covers most of the area known as the "Grand Prairie." The project area is approximately 40 miles in length and averages about 15 miles in width; Stuttgart is located near the center. This area is underlain by the Mississippi River Valley alluvial aquifer of Quaternary age which supplies about 82 percent of all the water used in the project area, and its primary use is agricultural irrigation.

PROJECT BOUNDARY

MEMPHIS DISTRICT BOUNDARY





US Army Corps
of Engineers
Memphis District

EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
PROJECT AREA

Scale in miles



PLATE 2

HISTORY

The name given to this area, "Grand Prairie," is descriptive of what was once a vast grassland prairie situated on an almost flat plateau. Rice was introduced as a commodity crop in 1904 and has proven to be well suited to the area due to many factors including soils, topography, climate, and water supply. The Grand Prairie is now one of the major rice producing areas in the world. Arkansas, ranked number one in rice production in the United States, annually produces approximately 42 percent of the national crop. The problem of declining groundwater levels in the alluvial aquifer was first noted in 1927, and can be directly attributed to the extensive groundwater pumpage necessary to irrigate rice. Numerous studies by Federal and state agencies since that time have shown that serious water declines in the water table have continued over the area. A project to provide supplemental water to the Grand Prairie region was authorized by the Flood Control Act of 1950, House Document 255; however, a project was never funded or constructed.

TOPOGRAPHY

The project area lies in the Mississippi Alluvial Plain physiographic region. The land slopes generally eastward and southeastward from the northwest corner of the project area. An area north of a line between DeValls Bluff and Carlisle primarily drains to the north. A narrow fringe of land along the west side of the project area from Carlisle to Stuttgart is drained by minor streams that flow west toward Two Prairie Bayou and Bayou Meto. Elevations in the project area exceed 230 feet mean sea level (msl) in limited areas to the west of DeValls Bluff, and dip below 200 feet msl in bottomlands along larger streams in the southern portion of the area. Most of the Grand Prairie is underlain by a stiff, relatively impervious clay. Very little water can percolate through it; as a result, most precipitation evaporates, is transpired, or runs off. Gentle land slopes allow for well spaced levees, and there is only a slight loss of irrigation water by infiltration through the clay cap. These are the principal factors that make the Grand Prairie ideally suited for rice production.

LAND USE

Land resources are abundant in the project area. The soils consist primarily of silt loams and are very well suited to crop production. Agriculture is the dominant land use in the Grand Prairie and is the foundation of the area's economy. Of the 362,662 total acres in the project area, 254,406 acres are cropland. Cropland includes 247,556 acres of irrigated cropland; the breakdown of irrigated acreage is shown in Figure 1. Also included in cropland are: 4,571 acres of grassland and 2,279 acres set aside in the Conservation Reserve Program (CRP). The remaining area consists of 41,957 acres of forest land, 15,566 acres of reservoirs, and 50,377 areas of miscellaneous use.

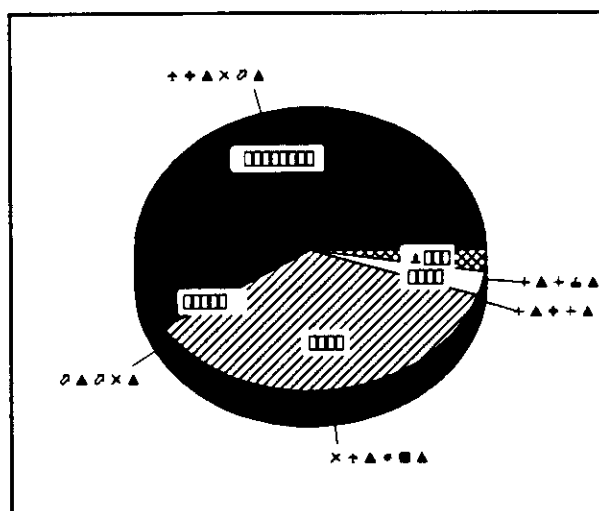


Figure 1
Existing Land Use - Breakout of Irrigated Cropland

WATER RESOURCES

The water resources of eastern Arkansas, groundwater and surface water, cannot meet the demands that are being placed on them. Capturing and storing runoff in reservoirs and utilizing it as a source of irrigation water has become common practice in eastern Arkansas, particularly in the Grand Prairie region. In the last 20 years, total water use, particularly groundwater use, in eastern Arkansas has dramatically increased. Since the elimination of rice acreage controls in 1975, rice has become an increasingly significant crop in areas other than Grand Prairie region. Approximately 89 percent of the total consumptive water use in eastern Arkansas is for agriculture. Figure 2 shows how consumptive water increased from 1960 to 1981. In 1985, withdrawals from the alluvial aquifer, the principal source of irrigation water in eastern Arkansas, exceeded recharge by 17%. Projections are that this disparity will increase until the available yield of the aquifer is the annual recharge. The large quantity of water withdrawn for irrigation has resulted in a rapidly declining water table.

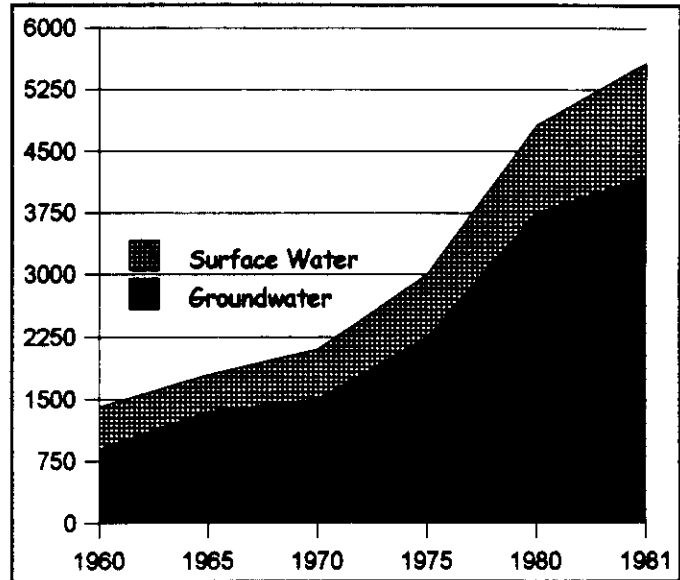


Figure 2
Consumptive Water Use in Millions of Gallons Per Day

Water is essential to eastern Arkansas' farmers. Each year, these farmers risk planting crops that may be lost due to a lack of water. In this day of tight credit and high production cost, one bad crop can put a farmer in bankruptcy. Water is the insurance that producers cannot be without. When securing financing, producers utilizing irrigation systems are considered much better risks. Today, a majority of lending institutions insist on irrigation systems before a loan application will be considered.

Water has always been essential in growing rice - which is a billion dollar industry in eastern Arkansas. Now, irrigation of other crops has become essential in sustaining production at profitable levels. Table 1 shows the effect of irrigation on soybeans for the period 1971 to 1980 (Delta, Arkansas).

Table 1. GRAND PRAIRIE AREA DEMONSTRATION PROJECT Soybeans - Bushels per Acre		
Yield Year	Irrigated	Nonirrigated
1971	35.7	30.0
1972	45.6	24.8
1973	37.8	20.5
1974	35.9	35.9
1975	29.4	29.4
1976	40.2	19.8
1977	40.4	29.6
1978	30.0	9.0
1979	34.6	34.6
1980	30.6	4.9
AVERAGE	36.0	23.9

Surface Water

The Grand Prairie lies between two major tributaries of the Mississippi River, the Arkansas and White Rivers. Major tributaries to these rivers that are located within the project area include La Grue Bayou, Little La Grue Bayou, Mill Bayou, and King Bayou. Two others, Prairie Bayou and Bayou Meto, form part of the western boundary of the project area; however, only a small portion of the project area directly contributes runoff to these streams. The largest and most significant stream within the project area is La Grue Bayou which traverses the length of the project area.

Streams within the project area have relatively flat gradients which contribute to sluggish streamflow. This is greatly complicated by the many weirs and dams that have been placed in most natural streams. These obstructions create pools that enable diverting water directly to fields or to fill storage reservoirs for later use. Consequently, dependable surface water supplies are extremely limited by the extensive use of surface water for irrigation. Most streams within the project area have only seasonal flows.

Peckerwood Lake, a privately owned impoundment constructed on La Grue Bayou, is the only major body of water (2,400 acres) in the project area. Although its main purpose is for irrigation, it is also a valuable waterfowl and fisheries resource.

Groundwater

Probably no other environmental subject has been plagued by as much misunderstanding, confusion, and myths as groundwater. Groundwater serves as a source of well water and can provide base flow for some streams. Aquifers are geologic formations capable of storing and transmitting water: they serve as both a storage reservoir and a conduit for water flow. There are generally two types of aquifers, unconfined and confined. In unconfined aquifers, the saturated zone is free to rise and fall in response to recharge and discharge to wells. Atmospheric pressure changes are freely

transmitted downward, through the unsaturated zone, to the saturated zone which is commonly called the water table. Unconfined aquifers yield water by draining aquifer material near a well. A well produces water by lowering the water table adjacent to it in the shape of an inverted cone commonly referred to as a "cone of depression."

Confined aquifers are those that are overlain and underlain by impermeable rock, clay or other material which prevents vertical movement of air or water. When a confined aquifer is penetrated by a tightly cased well, water will rise in the pipe to an elevation above the top of formation being tapped. These aquifers are termed "artesian" although all do not discharge water above the ground surface. Confined aquifers yield water by expansion of the water, compression of the aquifer, drainage of adjacent unconfined zones, and vertical leakage through confining layers. The aquifer with which we were most concerned in this study is the Mississippi River Valley alluvial aquifer, the unconfined aquifer underlying the Grand Prairie region.

Studies conducted by the U. S. Geological Survey and Arkansas Soil and Water Conservation Commission show that, throughout portions of eastern Arkansas, water levels in the alluvial aquifer are declining about 1 foot per year. In some areas of the Grand Prairie, water levels in the alluvial aquifer have declined as much as 90 feet since irrigation began. Figure 3 illustrates the water level declines in the alluvial aquifer near Stuttgart.

The tertiary (confined) aquifers that underlay the alluvial aquifer offer little with respect to long term dependability. These aquifers cannot provide the volume of groundwater that the alluvium aquifer does; widespread use would quickly deplete reserves. However, these tertiary sands are being tapped as the alluvial aquifer is depleted; and, as a consequence, water levels in the Sparta aquifer (a tertiary sand) in the Grand Prairie region have declined as much as 100 feet since 1905.

HYDROLOGY

A hydrologic study was made of the project area existing streams. This information was used to design the delivery system without inducing flooding.

GEOHYDROLOGY

From the early 1900's to the present, the alluvial aquifer has been the predominant water source for crop irrigation in eastern Arkansas. The alluvial aquifer is an unconfined aquifer composed of coarse sand and gravel, grading upward to fine sand; its upper confining unit is composed of clay, silt, and fine sand. The thickness of the alluvial sediments in eastern Arkansas generally ranges from 125 to 200 feet. Its average thickness is approximately 150 feet. In the Grand Prairie area, its thickness ranges from about 60 to 140 feet; most of the aquifer is between 80 and 100 feet thick. These thickness variations in the aquifer are related to the paleotopography of the underlying Tertiary contact as well as the variable thickness of the upper confining layer. The thickness of the aquifer is important in terms of physical constraints; however, the saturated thickness of water bearing sands

is the most critical factor in the amount of water that the aquifer can yield in terms of pumpage rate and future yield.

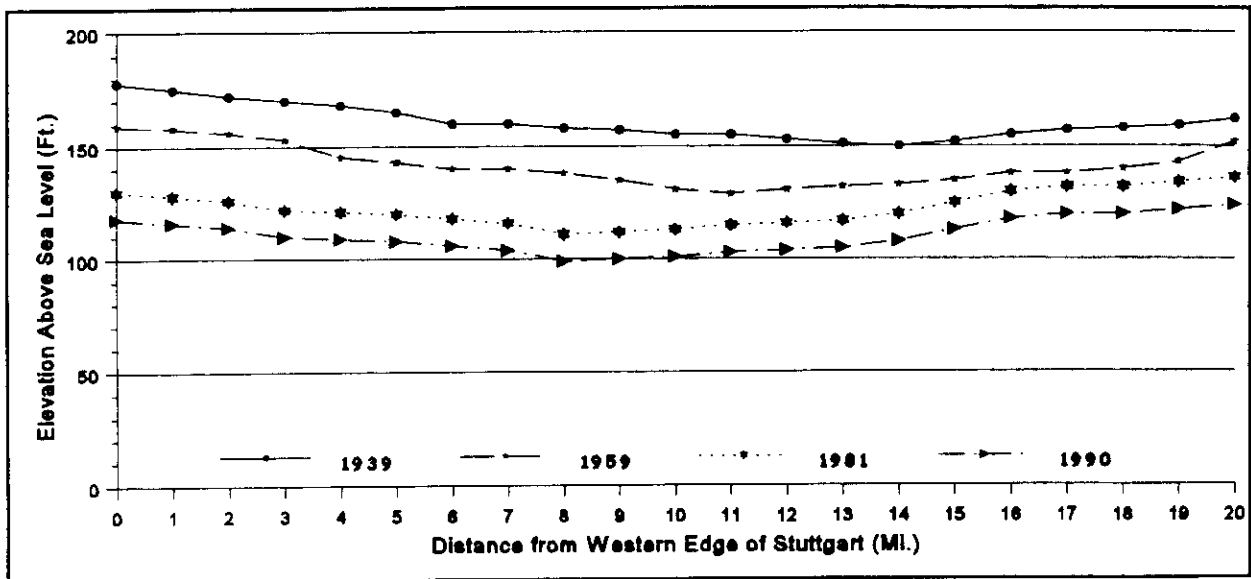


Figure 3
Historical Water Surface Elevations of the Alluvial Aquifer in the Stuttgart Area
Note: Ground Surface Approximately 220 Feet Above Sea Level

Although it cannot provide the volume of the alluvial aquifer, the Sparta sand underlying the alluvial aquifer is a major groundwater resource. As the alluvial aquifer has been depleted, pumpage from the Sparta sand has increased. Over the years, pumpage by municipalities and the increased usage by agricultural users have caused significant drawdown of the Sparta piezometric surface.

Groundwater in the alluvial aquifer flows from north to south with gradient changes toward cones of depression. The piezometric surface of the alluvial aquifer varies from approximately 280 MSL in the north near the Missouri state line to approximately 70 MSL in the south. There are three large cones of depression in the alluvial aquifer in eastern Arkansas. The largest is located within the Grand Prairie Region and Bayou Meto Basin primarily because crop irrigation first began in this area. In the Grand Prairie region, the piezometric surface varies from 140 to 90 feet.

GEOLOGY

The Grand Prairie is a Pleistocene terrace plain, a distinct subdivision of the Mississippi Alluvial Plain physiographic region. The Grand Prairie project area is underlain by deep sedimentary deposits of the Mississippi Embayment. The western margin of the embayment is marked by the "Fall Line" located approximately 20 miles northwest of the project area. This "Fall Line" separates the Gulf Coastal Plain from the Interior Highland. The geologic units of the Gulf Coastal Plain contain the Quaternary alluvium and Sparta aquifers.

Paleozoic rocks making up the basement structure are overlain by Cretaceous sediments of marine origin. These units are in turn overlain by a series of Tertiary deposits which are divided in ascending order in the Midway, Wilcox, Claiborne, and Jackson Groups. Some water is withdrawn from sands in the upper three groups, especially the Sparta sand in the Claiborne Group; however, the Quaternary alluvium is the principal aquifer for the Grand Prairie region.

Low-permeability soils form an upper confining layer to the underlying water bearing sands and gravel. This confining layer, known as the "clay cap," is generally about 60 feet thick over the Grand Prairie, but its thickness ranges from less than 10 feet to more than 100 feet. Ironically, this clay cap that minimizes deep percolation and makes much of the delta ideal for growing rice also prevents vertical recharge to the alluvial aquifer.

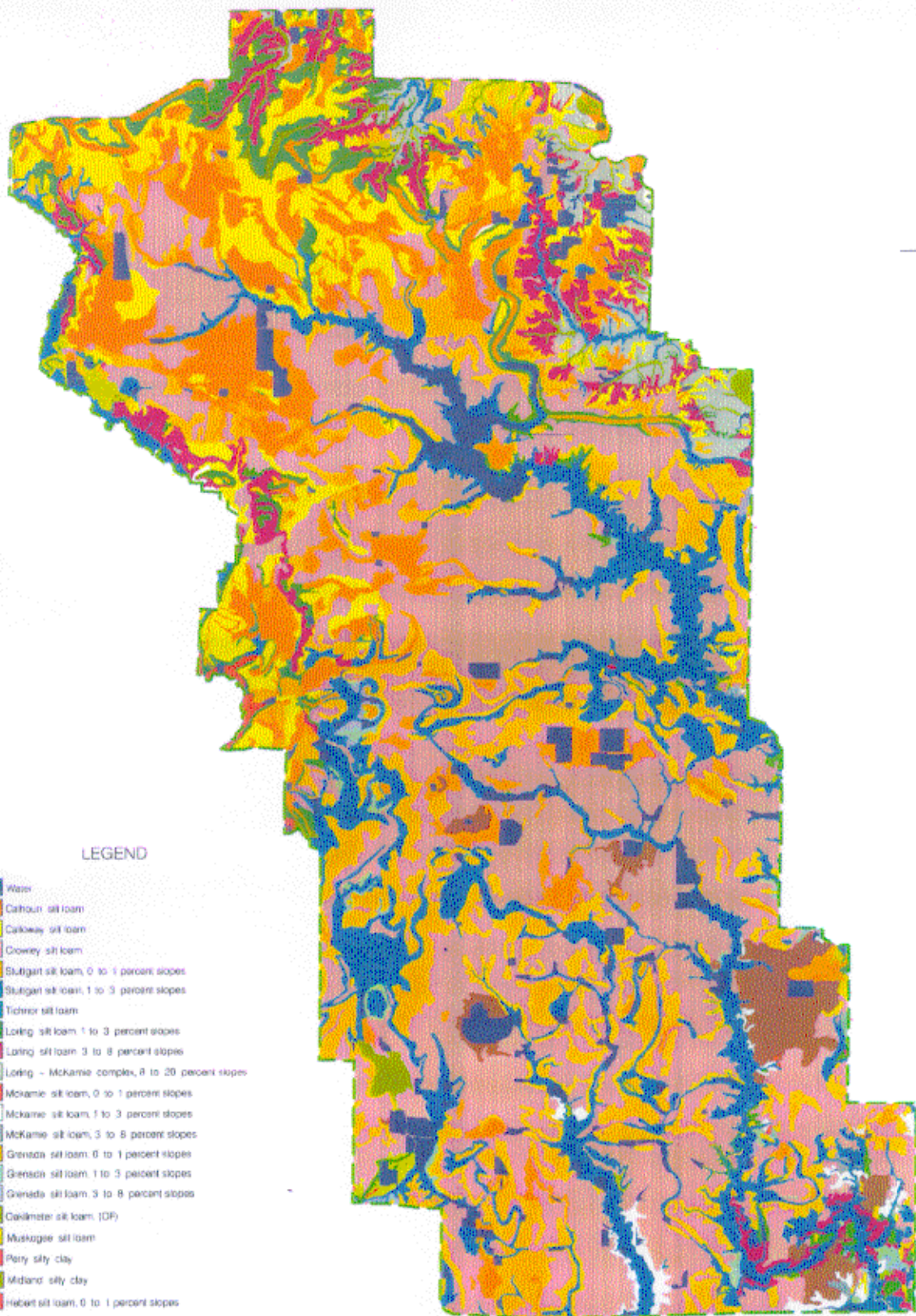
SOILS

Soils delineation for the project area was accomplished by the NRCS on USGS quadrangle maps. Memphis District personnel digitized this information and integrated it into the Geographic Information System (GIS) database for use in analyses and impact assessments. Plate 3 shows the soils delineation for the project area.

Major soils within the Grand Prairie project area include the Calhoun, Calloway, Crowley, Loring, Stuttgart, and Tichnor series. Table 2 provides a summary of the soils information for the project area.

Minor soils within the project area include: moderately well drained, loamy Grenada soils on terraces and uplands; well drained, loamy McKamie soils on uplands; moderately well drained, loamy Muskogee soils on terraces and uplands; and moderately well drained, loamy Oaklimer soils on Flood plains.

Most of the soils in the project area have restrictive layers at 10 to 12 inches which have developed from long term farming. These dense layers, known as traffic pans, limit rooting depth, water holding capacity, and groundwater recharge. As a result, crops cannot endure long periods without rainfall or irrigation.



LEGEND

- Water
- Calhoun silt loam
- Starkville silt loam
- Crowley silt loam
- Stuttgart silt loam, 0 to 1 percent slopes
- Stuttgart silt loam, 1 to 3 percent slopes
- Tishomingo silt loam
- Loring silt loam, 1 to 3 percent slopes
- Loring silt loam, 3 to 8 percent slopes
- Loring - McKamee complex, 8 to 20 percent slopes
- McKamee silt loam, 0 to 1 percent slopes
- McKamee silt loam, 1 to 3 percent slopes
- McKamee silt loam, 3 to 8 percent slopes
- Grenada silt loam, 0 to 1 percent slopes
- Grenada silt loam, 1 to 3 percent slopes
- Grenada silt loam, 3 to 8 percent slopes
- Coxsack silt loam, (DP)
- Muskogee silt loam
- Perry silty clay
- Midland silty clay
- Hubert silt loam, 0 to 1 percent slopes



US Army Corps
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Memphis District

EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY
GENERAL SOIL MAP
GRAND PRAIRIE AREA DEMONSTRATION PROJECT

Table 2.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Soils Information

SOILS SERIES	GENERAL CHARACTERISTICS	PHYSICAL LOCATION	PROBLEMS	LAND USE	CROPS
Calhoun	Very deep, level, poorly drained, slowly permeable, loamy soils	Broad flats	Wetness and surface drainage	Cropland	Rice, soybeans, and grain sorghum
Calloway	Very deep, level to nearly level, somewhat poorly drained, slowly permeable, loamy soils	Terraces	Moderate wetness and erosion	Cropland	Soybeans, rice, grain sorghum, and wheat
Crowley	Deep, level, somewhat poorly drained, very slowly permeable, loamy soils	Terraces	Moderate wetness and surface drainage	Cropland	Rice, soybeans, and grain sorghum
Loring	Very deep, nearly level to moderately steep, moderately well drained, slowly permeable, loamy soils	Terraces and uplands	Erosion	Cropland, pasture, and woodland	Soybeans and winter small grains
Stuttgart	Very deep, level to nearly level, moderately well drained, very slowly permeable, loamy soils	Terraces	Moderate wetness and surface drainage	Cropland	Rice, soybeans, and grain sorghum
Tichnor	Very deep, level, poorly drained, slowly permeable, loamy soils	Flood plains	Long period flooding	Woodland	None

NAVIGATION

Channel maintenance for navigation on the White River was authorized by Congress in 1892 in order to maintain a navigation channel with a minimum depth of 4.5 feet. Section 107 of the Rivers and Harbors Act of 1960 authorized the following: an increase the minimum authorized channel to 8 feet from the mouth to Augusta, AR for gage readings at Clarendon, AR of 12 feet or higher; a minimum channel depth of 5 feet from the mouth to Augusta, AR for gage reading at Clarendon, AR less than 12 feet; and a minimum channel depth of 4.5 feet from Augusta, AR to Newport, AR. Present dredging practice maintains a minimum channel depth of 8 feet from its mouth to Newport, AR when the Clarendon, AR gage is 12 or greater. Maintenance dredging currently begins during July and generally ends in October of each year.

METEOROLOGY

The climate of the Grand Prairie region is temperate with long, warm summers and short, moderately cold winters. Mild and humid would generally classify the climate of the region. Monthly average temperatures range from approximately 43 degrees Fahrenheit in January to approximately 83 degrees Fahrenheit in July. Occasional periods of excessive summer heat and winter cold are common. The first and last killing frosts normally occur in mid-October and early April, respectively. The mean freeze-free period is about 200 days.

The average annual rainfall for the project area is approximately 49 inches based on the National Weather Service gage in Stuttgart. The months of March, April, and May have the highest average rainfall; July, August, September, and October have the lowest average monthly rainfall. This distribution does not correlate to the timing of water needs for agriculture. Normal year rainfall provides for excess water during the winter and early spring months and a deficit during the summer and early fall months. Water during these deficit months is critical to crop production. Without a supply of water during these months, crop yields would be significantly impacted and farming would not be a feasible venture. Local farmers have implemented measures to capture and store existing runoff both on their own and through on-going farm programs administered by the NRCS. Evaporation for the project area is high, averaging 52 inches annually. Snowfall in the area is very moderate with an average annual amount of approximately 2 inches.

WATER QUALITY

Surface water quality is primarily influenced by the area's topography, soils, and land use. The primary surface water pollutant is suspended sediment which is a direct result of the area's extensive agricultural land use practices. Irrigation water currently being used in the Grand Prairie is a mixture of groundwater extracted from the alluvial and Sparta Sand aquifers and surface water captured in tailwater recovery systems. Water from these sources is mixed and applied to the crops in various proportions. Existing data indicates that the quality of both surface water and groundwater is relatively good and poses no immediate problem to agriculture. The key characteristic of importance to agricultural productivity is salinity or total dissolved solids. Salinity does not appear to be a problem in the area. All water sources currently being used have moderate levels of total dissolved solids, well below the suggested limits for long term agricultural activity. Water quality analyses conducted by the University of Memphis Ground Water Institute are included in Volume 9, Appendix C, Section III, Water Quality.

ENVIRONMENT

The Grand Prairie is a unique region. Aside from its value to agriculture, the region contains natural lakes, bayous, manmade lakes and reservoirs, both large and small drainage ditches, large acreages of water devoted to aquaculture, large acreages of seasonally flooded fields and reservoirs for duck hunting, bottomland hardwood tracts, and prairie remanents.

Natural Resources

Historically, a series of discontinuous prairies occurred in Louisiana and eastern Arkansas on poorly dissected Pleistocene terraces of the Mississippi River Valley. The largest of these prairies was the Grand Prairie which covered approximately 500,000 acres. Today only about 500 acres of prairie remain in small, widely scattered tracts within the historical Grand Prairie region; approximately 80-90% of these prairie remnants are contained within the project area.

The region comprising the Grand Prairie and Lower White and Cache River bottoms is probably the most important wintering area for mallards in North America. Its location in the heart of the wintering range of the Mississippi Flyway, its historically abundant wetland resources, and its bounteous and sundry food sources make it truly a unique and rare natural resource. Stuttgart, Arkansas, centrally located in the Grand Prairie region, is known as the "Rice and Duck Capital of the World". The Grand Prairie is internationally recognized for providing exceptional waterfowl hunting.

Wildlife Habitat

Wildlife distributions and populations depend largely on the quantity and quality of available habitat. Land use and management, water availability, and climate are factors that influence habitat conditions. The diversity and abundance of wildlife is directly related to the availability of suitable habitat. The terrestrial wildlife habitat of the Grand Prairie project area consists of three general vegetative cover types: forest (41,957 acres), grassland (4,571 acres), and cropland (254,406 acres).

Forest includes both bottomland and upland communities. Wildlife species dependent upon woodland habitat in the project area include: white-tailed deer; fox and gray squirrels; southern flying squirrels; woodchucks; eastern cottontail rabbits; swamp rabbits; eastern spotted and striped skunks; river otters; bobcats; minks; raccoons; coyotes; ninebanded armadillos; red and gray foxes; wild turkeys; various song birds, woodpeckers, and raptors; and numerous reptiles and amphibians.

Grassland consists of native prairie (or native pasture) and improved pasture land. Composition of vegetation varies depending on soil type, soil moisture, and management practices. Well managed native pasture or prairie generally includes a mixture of tall grasses composed principally of big bluestem, little bluestem, switchgrass, Indiangrass, and numerous forbs. Broomsedge, silver bluestem, splitbeard bluestem, and ragweed generally take over in poorly managed areas. Woody species such as sweetgum, ash, sumac, and persimmon also invade unmanaged areas. Bermudagrass is the dominant species adopted for improved pasture land. Cropland, the dominant landuse/cover type within the project area, consists of 254,406 acres of seasonal crops that require frequent or seasonal tillage and intensive management practices, or both. Crops grown in the area include rice, soybeans, wheat, grain sorghum, and corn. Many wildlife species rely heavily on these croplands as a food source; not only is the grain utilized by various species of wildlife, but the insects and other wildlife attracted to crop fields are eaten by predators. Some of the species or groups that are commonly encountered in the cropland cover type and adjacent edge communities include white-

tailed deer, rabbits, raccoons, fox, mice, rats, wild turkey, bob-white quail, mourning doves, flycatchers, sparrows, raptors, waterfowl, and shore birds.

Fisheries

Because of desiccation during the summer, only low-quality fisheries exist in most of the small tributary streams within the project area. Extensive diversion of flows from streams for field application and for filling of reservoirs has limited the quantity and quality of fisheries within project area streams. The highest quality fisheries now exist in multi-purpose reservoirs (i.e., reservoirs managed for sport fisheries as well as irrigation water), the 2,400 acre Peckerwood Lake, and the White River and its associated oxbow lakes.

Wetlands

Wetland and deepwater habitats found in the project area include bottomland hardwoods, forested swamps, scrub/shrub swamps, marsh, riverine, and impoundments (lacustrine). Wetland communities are extremely high in species diversity and provide essential habitat for many species. Species include ducks, geese, herons, egrets, shore birds, songbirds, birds of prey, raccoons, rabbits, beavers, muskrats, white-tailed deer, reptiles, and amphibians. A total of approximately 28,387 acres of wetlands exists within the project area.

Cultural Resources

A series of cultural resources surveys for lands included in the project rights-of-way was conducted. The work was conducted by reach for the 11 reaches as designated at the time of the surveys. Approximately 11,000 acres were surveyed and 174 sites were identified, including 151 with historic only components, 10 with prehistoric only and 13 with both prehistoric and historic remains. Sites range in age from Paleo (9500 B.C. - 7800 B.C.) to present. Included within the 151 historic components are 44 structures; an additional 18 structures were recorded, but were not given site numbers.

Endangered Species

One endangered fish species, pallid sturgeon (*Scaphirhynchus albus*), and one endangered mussel species, pink mucket pearlymussel (*Lampsilis abrupta*), occur within the study area portion of the White River. The threatened bald eagle (*Haliaeetus leucocephalus*) is a transient species, resting and feeding along the White River during its winter migration. However, no large concentrations of eagles have been observed along this portion of the river; and no nest sites are known to be located within the study area. All project-related matters concerning these species were coordinated with the U.S. Fish and Wildlife Service.

Hazardous, Toxic, and Radioactive Waste (HTRW)

A Phase 1 Assessment of the potential for HTRW was conducted for the project area. The assessment relies on site inspections, aerial videotapes and photographs, and document research. Based on these investigations, it is concluded that no HTRW would be encountered during project construction and no additional HTRW work is recommended unless new information determines otherwise. The HTRW Phase 1 Assessment is included in Volume 9, Appendix C, Section IX.

Recreation

The two major recreational activities within the study area are hunting and fishing. The Grand Prairie is renowned for providing exceptional waterfowl hunting. White-tailed deer, turkey, and squirrel hunting are extremely popular in woodland areas. Although fishing is limited in most of the project area tributary streams, Peckerwood Lake, the White River and associated oxbow lakes, numerous multi-purpose reservoirs, and larger irrigation canals offer moderate to excellent fishing. Fishing access is limited on reservoirs and canals since they are privately owned. The uplands, wetlands, and waters of the study area furnish nonconsumptive recreationists with opportunities to participate in bird watching, nature photography, hiking, boating, and other activities.

SOCIOECONOMIC PROFILE

According to the Census Bureau, the combined population in Prairie and Arkansas counties declined from 34,315 in 1980 to 31,171 in 1990. During this same decade, while employment was up in manufacturing and down in wholesale and retail trade (both by 4%), agriculture experienced a 20% drop in employment. Overall unemployment grew from 5% to 6.2%, and the number of occupied housing units declined from 12,567 to 12,050. Although per capita income almost doubled, from \$5713 to \$10,397, the incidence of poverty slightly increased. In 1990, 21.1% of persons in the two counties was below the poverty level --- up from 20.8% in 1980. The percent of high school and college graduates increased during the period.

In 1990, only about 6% of total employment was in health services. Prairie County was still rural, while almost half of Arkansas County's population lived in the town of Stuttgart. Stuttgart also accounted for about one-third of the population in both counties, and approximately 18% each of the employed and unemployed. Manufacturing and retail trade comprise the largest employment industries in the state. This is also true for the two counties. Although the incidence of poverty there is above the state average of 19.1%, the rate of unemployment is lower than that statewide (6.8%).

By 1995, the population in both counties had declined even further to 30,344. The project is expected to increase urban and rural employment, with corresponding growth in other areas of the local economy.

FUTURE WITHOUT PROJECT CONDITIONS

AGRICULTURAL WATER SUPPLY

The existing or desired landuse and the demand for irrigation water would not be expected to change at anytime in the foreseeable future. However, the availability of groundwater to sustain existing and future agriculture needs is expected to be significantly reduced as the aquifer is depleted. The supply of irrigation water is projected to decrease as shown in Figure 4. Existing on-farm storage and in-season recovery of irrigation water and rainfall are projected to remain the same. Continued declines in aquifer will result in drastic reductions of available water in the near future. The aquifer yield is projected to reach its sustainable recharge level of 35,574 acre-feet per year by the year 2015.

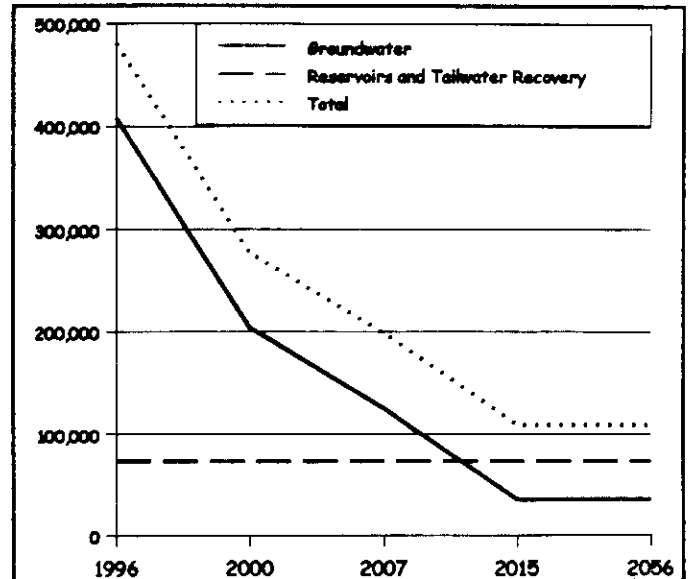


Figure 4
Projected Groundwater Supply, Without-Project Conditions

ECONOMIC RESOURCES

The reduction in available irrigation water translates into a substantial reduction in irrigated acreage. Projected without project land use is presented in Figure 5. (Note: Cropland, irrigated cropland, and water supply and demand data presented in the economic analysis differs in that the 8,849 acres of proposed on-farm storage is take out of the single-cropped soybean acreage and the 3,070 acres of aquaculture is included in irrigated acreage.) The aquifer will continue to be depleted and approximately 187,129 acres of irrigated cropland will convert to dryland farming by the year 2015. This results in a net revenue decrease from the current level of \$23.9 million to \$14.9 million by 2015. A detailed discussion of the without project conditions is provided in Volume 10, Appendix D, Section II.

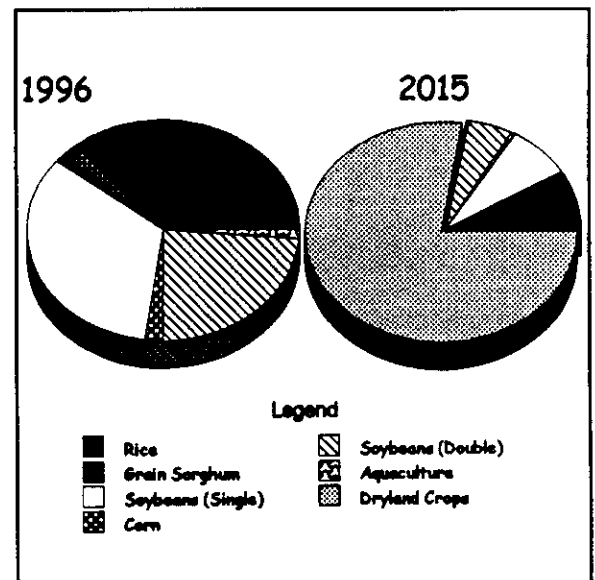


Figure 5
Present and Projected Without-Project Landuse

ENVIRONMENTAL RESOURCES

Without project implementation, the water levels beneath the Grand Prairie will continue to decline, rapidly increasing the distance from the wetlands to the water table. This will have a drying effect on the wetlands. Recharge from the aquifer to natural streams will decrease as the aquifer declines, thereby, changing the ecology of the riverine system.

WATER QUALITY

Agricultural practices in the project area are not expected to change in the foreseeable future, thus the demand for irrigation water will remain. As the aquifer is further depleted the potential for intrusion of salt water is increased. Continued and more intensified use of surface water for irrigation will degrade the quality of the water and further lower the quality of fish and wildlife habitat.

CONCISE STATEMENT OF PROBLEMS, NEEDS AND OPPORTUNITIES

NATURAL RESOURCES

The Grand Prairie was the largest (approximately 500,000 acres) in a series of discontinuous prairies which historically occupied portions of Louisiana and Arkansas. However, cultivation has reduced this once vast grassland to ten isolated remnants totaling approximately 500 acres. Although many wildlife species indigenous to the prairie vanished, waterfowl still migrate to this region in large numbers. Prairie remnants and waterfowl are two ecologically important features of the Grand Prairie. As a project component, native prairie vegetation would be established within the rights-of-way of new irrigation canals. In addition, the tentative selected plan would flood 38,525 acres of harvested rice fields on an average annual basis to benefit waterfowl.

Fisheries within the tributary streams of the project area have been heavily impacted by excessive removal of surface water for irrigation purposes. The project would supply water from the White River to these streams; this additional water and the pooling effect of project weirs would provide a substantial increase in fishery habitat.

A recent study conducted by the University of Memphis, Ground Water Institute, indicated that groundwater-influenced wetlands along the White River would be adversely impacted by the continued depletion of the alluvial aquifer. It also revealed that the tentative selected plan could prevent or slow the "drying" effect of aquifer depletion on these wetlands.

AGRICULTURAL WATER SUPPLY

The major resource problem in the project area and eastern Arkansas is the lack of a dependable water supply to continue irrigation of cropland. The alluvial aquifer, which is the primary source of agricultural irrigation water for all eastern Arkansas is seriously depleted. Groundwater withdrawals over several decades in excess of recharge (safe yield) have resulted in several large cones of depression in the aquifer. The largest cone is centered over the Grand Prairie in Arkansas, Prairie, and Lonoke counties. Groundwater depletion is one of the most serious and far reaching problems that faces the eastern Arkansas region. Impacts will be of national significance as this region produces approximately 42 percent of the national product of rice and significantly contributes in soybean, wheat, and other grain crops.

NAVIGATION

The current project on the White River as discussed in a previous section of this report does not provide a channel that supports year round navigation or that meets the needs and desires of local navigation interests. Toward reaching these goals local interests were instrumental in the recent authorization of the White River, Arkansas project for navigation, Section 363(b) of the WRDA 1996, Public Law 104-303. The specific problems, needs, and opportunities as related to navigation on the White River were beyond the scope to this study. However, extensive analyses and evaluations were performed to assess any impacts that might be incurred as a result of the demonstration project implementation. These results of these analyses are presented in Volume 3, Appendix B, Section I, Part D, Topic D, White River and Volume 10, Appendix D, Section III, Optimization of On-Farm Features and White River withdrawals. The Grand Prairie Project would have no effect on the project for navigation reauthorized by WRDA 1996.

ECONOMIC

Use of water in eastern Arkansas is closely related to economic growth and development. The economic results of exhausting the aquifer would be catastrophic. The social well being of the people would be jeopardized. The future of the industry that is the economic base of the region and supports all other industry - agriculture, is threaten to non-existence.

Many farms within the project area cannot meet all of an average year's water needs and as such only partially irrigate their crops. Farmers have started tapping a deep aquifer to supplement their water needs. Studies have shown that this is only a short term solution. The deep aquifer can not sustain a yield to meet the irrigation requirements and is very expensive both in capital investment and operating costs. Farmers can only justify using the deep aquifer in conjunction with the much cheaper surface and shallow aquifer costs.

Without an alternative source of water, irrigation to sustain farming at profitable levels cannot continue. This will have a significant, adverse economic impact on the local economy. It will force farmers, farm supply dealers, and lending institutions into bankruptcy along with others not directly

related to agriculture, whose livelihood depends on the moneys provided by agriculture to the local economy.

SUMMARY

The consequences of aquifer depletion can be prevented or at least limited by providing a supplemental source of irrigation water, thereby maintaining the aquifer at a level which would allow for a sustained yield. The only solution to eastern Arkansas's and particularly the Grand Prairie's groundwater problem is an alternative water supply with conservation.

PROJECT PLANNING AND DEVELOPMENT

INVENTORY AND FORECAST RESOURCES

Early in the scoping process, during development of the Initial Project Management Plan (IPMP), it became apparent that the collection, assimilation, management and utilization of data for a project of such magnitude and complexity could not be efficiently accomplished without a special management tool. Data would be collected, developed, and utilized by numerous parties both inside and outside the Corps. Easy transfer of data to and from a central data bank was essential to efficient execution of studies. In order to be compatible with existing in-house survey and mapping, computer-aided drafting and design (CADD), and database software, a Geographic Information System (GIS) was developed using Intergraph Microstation MGE software and, in cooperation with the University of Memphis, ARC/INFO.

BASE MAPPING

Existing mapping of the Grand Prairie area consisted of U. S. Geological Survey quadrangle maps which were outdated and inadequate for the level of detail required for planning, engineering and design studies. Physical conditions of the area had changed significantly over the past 20 years. USGS quads did not include many existing features such as on-farm storage reservoirs, irrigation canals, tailwater recovery systems, minnow and fish ponds, converted farmlands, and structures that were critical in project planning and development.

AERIAL PHOTOGRAPHY

Survey control points were established and aerial photography for the project area was obtained. Based on the data needs and analyses required for the study and an evaluation of the cost associated with mapping of the area at various altitudes, it was determined that flying the area at 12,000 feet would provide the level of detailed needed and be the most time and cost effective. Photography at this altitude provided current mapping at an accuracy within acceptable design limits. Photo coverage of the project area included 253 photos at a 1:24000 scale which is 1 inch = 2,000 feet.

TOPOGRAPHIC INFORMATION

One hundred and six picture ties or control points were identified and surveyed to establish reference coordinates for digital map generation. Channel cross sections along existing streams were obtained for hydraulic modeling and engineering design. Detailed surveys of the pumping station and diversion site along the White River were conducted. Other topographic information was obtained to meet the planning, engineering and design needs for the general reevaluation. All survey data was input into the model for improved accuracy.

3-D MODEL

Two hundred and forty-one stereo pairs were compiled on a KERN DSR 14 analytical stereo plotter to generate 3D topographical maps for the project area. All physical features (roads, streams, reservoirs, levees, railways, etc.) were drawn in 3D. Mapp/Pal/Albany software was utilized for analytical aertriangulation. DTMCOL software was used for digital terrain model grid points.

All topographic data was imported into Intergraph MGE Modeler software to generate contours to National Map Accuracy Standards. Five foot interval contours were used for mapping the project area.

DATA COLLECTION AND ASSIMILATION

DATABASE & GEOGRAPHIC INFORMATION SYSTEM (GIS)

The 3-D topographical model was the base of the GIS system. Other information was input on levels that could be active or inactive depending on data needs. The structure and various layers of data contained within the GIS are shown in Table 3. Briefly, the GIS consists of base map data, hydrography, natural resources, and hydraulic features. Each of the data layers are described in the following sections. The true utility of the GIS lies in its ability to link tabular and graphical data. Along with all of the graphical features contained within the GIS, there exists a corresponding tabular entry containing descriptive information about each unique feature. Table 4 describes the tabular data for each of the data layers within the GIS.

Table 3.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Summary of GIS Database

THEME/ CATEGORY	DESCRIPTION	SOURCE	FORMAT
Base Map	Physical Features (Roads, Railroads, Cities, Airports, etc.)	Aerial Photography	Intergraph MGE, ARC/INFO
	Jurisdictional (City Limits, County Lines, WRRIWDD Boundaries, etc.)	USGS, WRRIWDD, & County Maps	Intergraph MGE, ARC/INFO
	Property Lines & Ownership	Farm Service Agency	Intergraph MGE, ARC/INFO
	Contours Land Use/Land /Cover Construction Items	Generated-InRoads Software Aerial Photography, FSA Project Design	Intergraph MGE Intergraph MGE Intergraph MGE, ARC/INFO
Hydrography	Rivers & Streams Wetlands	Aerial Photography USFWS - National Wetlands Inventory	Intergraph MGE, ARC/INFO ARC/INFO
Natural Resources	Habitats Forested Areas Prairies and Natural Areas Soils	Derived from Wetlands Data Aerial Photography Natural Heritage Commission NRCS & NWI	ARC/INFO Intergraph MGE, ARC/INFO Intergraph MGE, ARC/INFO Intergraph MGE
Project Features	Canals and Pipelines Weirs, Siphons Bridges, Culverts Relocations	Project Design Project Design Project Design Hardcopy, Field Investigations	Intergraph MGE, ARC/INFO Intergraph MGE, ARC/INFO Intergraph MGE, ARC/INFO Intergraph MGE, ARC/INFO
	Canal & Pipeline Rights-Of-Way	Project Design	Intergraph MGE, ARC/INFO

Table 4.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Tabular Data Associated with Each
GIS Data Layer

THEME/ CATEGORY	DESCRIPTION	TABULAR DATA
Base Map	Roads Property Lines & Ownership Contours Land Use/Land Cover Construction Items	USGS Road Classification (Interstate, US Highway, State Highway, or County Road FSA Identification Number, Township, Range, and Section Numbers; Owner and Operator Name and Address Elevation Land Use/Land Cover Classification Identification Number (Item Number)
Hydrography	Rivers & Streams Wetlands	Stationing & Cross Section Data NWI Wetlands Classification, COE Habitat Classification, Acreage
Natural Resources	Habitats Forested Areas Prairies and Natural Areas Soils	NWI Wetlands Classification, COE Habitat Classification, Acreage COE Habitat Classification, Acreage Natural Heritage Commission (NHC) Identification Number, Name Soil Type
Project Features	Canals and Pipelines Weirs, Siphons Bridges, Culverts Canal and Pipeline Rights-Of-Way Relocations	Identification Number Identification Number Identification Number Identification Number Type of Facility and Number of Each Location

Informix software was utilized to develop and structure a database to meet the data needs of the study. Due to a change in Memphis District's software this database was converted to Microsoft SQL 6.0 late in the study effort. To facilitate the completion of this phase of the project, a portion of the GIS development and analysis was performed by the Ground Water Institute (GWI) at the University of Memphis. Much of data developed in-house was converted by the GWI from Intergraph MGE design (DGN) files into ARC/INFO coverages in order to be compatible with data available only in ARC/INFO format.

LANDUSE

The base unit to which all landuse data is tied is the tract. A tract is a unit of land, identified by legal description and coordinate system, and having a unique Farm Service Agency (FSA -- formerly the Agricultural Stabilization and Conservation Service (ASCS)) identification number. Section G of the NRCS Documentation Report, Volume 2, Appendix A, Section II provides detailed

information on the FSA tract identification system. A farm may consist of a single tract or a group of tracts. Each individual farm also has an identification number. FSA maintains comprehensive records containing land use and cropping history for each farm tract participating in USDA farm programs. The project area includes 867 farms consisting of 1578 tracts of land. The FSA tract number was used as the record identifier for tract data.

Tract boundaries were transferred from FSA aerial photography to the Memphis District aerial photography used for generating the 3-D model of the project area. These photos were scanned and rectified and placed as a level in the GIS. Each tract record of the database was tagged to the centroid of the tract on the base map for retrieval and query.

Landuse was obtained from FSA records, aerial photographs, USGS quadrangle maps, NRCS records, and field inspection. FSA utilizes historical cropping records to calculate crop "base" acreages. Base acreages are computed on a farm basis. Crop distributions for individual tracts were computed assuming the same ratio as crop base acres for the entire farm. Fish pond acreage was determined by map measurements and is considered a crop with water requirements. Other bodies of water (fish & wildlife lakes, treatment lagoons, irrigation reservoirs, etc.) and landuse (woodlands, pasture, prairie, etc.) were identified and quantified from existing records, digitized aerial photography, and map measurement.

DEMAND & SUPPLY DATA

Water needs for each tract within the project were determined by the NRCS utilizing existing computer models in conjunction with several new models developed to assist in the analyses. Irrigation water requirements for each major crop grown in the project area were determined using an NRCS program call CONUSE. The results of this analysis were used in the NRCS water budget program to compute individual tract water needs.

Groundwater availability values from model studies conducted by the USGS and the University of Arkansas were input into the NRCS water budget model. A Project Cell Analysis program based on the cell format of the groundwater model used the surface water and groundwater data, water demands, available storage and conservation levels to establish the overall project import needs and peak import capacities. This analysis was not sufficient to determine water demands at the tract level.

A water budget program was developed to integrate land use, water demands, existing on-farm storage, planned storage, potential tailwater (runoff) capture, groundwater availability, and import needs for each tract of cultivated land in the project area. This model compares water demand, existing water supplies, and potential water supplies to determine total needs and peak quantities and times for each tract. This analysis included both crop and non-crop water needs and considered evaporation losses for surface water sources.

Existing (1992) and future with project demands were computed from the same landuse database. Adjustments to future with project conditions were as follows:

- ❖ All new on-farm storage would be constructed on cropland, thus reducing the irrigated acres.
- ❖ The priority of cropland reduction for reservoir construction is full season soybeans, late soybeans, and rice.
- ❖ No changes in woodland acres will occur.
- ❖ Total cropland acres will not increase and crop distributions will remain constant.
- ❖ An additional 38,525 acres of flooded cropland for winter waterfowl habitat at an average depth of 4 inches will be provided.

Groundwater modeling estimated the long-term sustained yield from the alluvial aquifer to be approximately 35,574 ac-ft per year for the Grand Prairie project area. The available groundwater for each tract was determined from the groundwater model cell data and proportioned to the irrigated acres for each tract within that cell.

Potential runoff capture is based on the irrigated acres and computed as a percentage of monthly rainfall. The volume of existing storage was determine by multiplying the surface acreage by an average depth of 8 feet. With project storage was based on a percentage of demand.

The total unmet need is the reduced demand after conservation less tailwater capture, available storage, and groundwater at the sustained level. Crop water budgets were prepared for 10-day intervals because a ten-day period is critical to crop production in terms of water availability. These results were utilized in computing the required delivery system capacities. A detailed discussion of these models and programs is provided in Section II of the NRCS Documentation Report, Volume 2, Appendix A.

ANALYSIS AND DATA APPLICATION

Data was assimilated and stored in the GIS for easy access and utilization by all study participants for planning, engineering, and design of the project.

DELIVERY SYSTEM

The delivery system consists of a major pumping station and a network of new canals, existing channels, pipelines, and associated structures to accomplish interbasin transfer of surface water to meet the needs of the project area.

Layout

Water will be pumped from the White River just north of DeValls Bluff into the primary artery of the canal system which extends westward to near Carlisle, then southward along the White River and Arkansas River drainage divide, to Lodge Corner. The primary canal feeds secondary canals, existing streams, and pipelines along its entire length. The secondary canals, existing streams, and pipelines feed other delivery system components until water is accessible to every tract of land within the project area. Gravity flow is utilized to the maximum extent practical. The water is controlled

by a system of water control structures. Plate 2 provides the general layout of the distribution system. Detailed plots of all systems components are included in Volume 8, Appendix B, Section VII, Reference Maps.

A team of NRCS personnel in close coordination with the Memphis District conducted the delivery system network analysis. Previous studies, aerial photography, USGS quadrangle maps, and field observations were used to plan and layout the delivery system. The delivery system was planned to provide water to all tracts within the project area. The initial layout was brought into a design file in the GIS overlaying the base map. Coordination of the proposed alignment with Federal, state, and local interests and the potential local sponsor; engineering and design, environmental, economic, and institutional considerations; along with other factors; resulted in numerous minor alignment changes throughout the planning of the project. A delivery system numbering system was developed which allowed for easy location and identification of individual components, automated analysis and design of the system, and modification. A detailed description of the delivery system network is provided in Section H of the NRCS Documentation Report, Volume 2, Appendix A, Section II. The results of the water budget model along with a delivery system data file was provided as input to the NRCS NETWORK program to determine the flow rates (Q's) required for each individual segment of the delivery system. Each tract was assigned an import water source located on a segment along a canal, existing channel, or pipeline. Segment Q's are determined by totaling Q's required for each of the tracts served by that segment plus the sum of Q's for any extensions or laterals serving other tracts.

Hydraulic Analyses

Initial sizing of the delivery system was based solely on the demand for irrigation water with the assumption that the White River could provide that demand upon call. Water supply and delivery was evaluated using a water balance approach. Detailed analyses of the delivery system (canals, turnouts, and pipelines) was conducted by steady and unsteady flow methodology. Information contained in the databases for the hydraulic analyses included daily records of White River discharge and stage, precipitation, rainfall runoff, tailwater capture, crop demands, waterfowl demands, sustainable groundwater yields, seepage, and minimum flow requirements for the White River.

Engineering Design

Canals

Calculations to determine excavation and fill quantities were made utilizing Intergraph Inroads Design Software using the 3-D GIS model of the project area. Topographical Triangulated Networks (ttn's) and Digital Terrain Models (dtm's) were used and templates "pushed" along horizontal and vertical alignments to obtain volumes of cut and fill needed to produce the required minimum canal cross section and levee height. In areas where needed fill was greater than the quantity of cut, vertical offsets were used to provide additional material in order to minimize haul distances and outside borrow areas. Vertical offsets ranged from 1.33 feet to 8 feet below the design grade. On select

canals, levee crowns were increased up to 20 feet wide, levee heights increased by as much as 8 feet and slopes flattened to 1V on 3.5H to dispose of excess material in reaches where cut exceeded fill.

Sections were "cut" for mass haul tables and graphs at various intervals. Intervals varied from 100 feet for short canals up to 2000 feet for canals eight to twelve miles long. The accuracy of the quantities obtained, as compared to a method more accurate than the end area method, varied with the length of the interval with the more accurate information coming from the shorter intervals. The longer section intervals were used to reduce computer processing time and were justified by the accuracy of the design models used to produce the data.

Real Estate

The landside toe of levees was used as a basis to calculate acres of right-of-way for the canals and levee structure. An additional ten feet of right-of-way was added beyond the levee toe for construction purposes to arrive at the final acreage required. The right-of-way requirements include any additional lands necessary for the disposal of excess excavated material. Lands required for construction of weirs in existing streams included access to the site. Real estate requirements at the major pumping station were based on planning, engineering and design site needs and access to the site.

Relocations

The delivery system layout and model was utilized to identify facilities impacted by project implementation and to identify modifications to reduce impacts and costs. All relocations were input into the GIS system for easy identification, location, and output.

Structures

A complex system of structural components is required to convey water in a controlled manner through the delivery system. The type, dimensions, and locations of the structures required were determined by the hydraulic analyses. Structures were located and identified on the GIS mapping and feature data incorporated into the database. Structure configurations, site plans, and conceptual designs were accomplished using Intergraph software. Volume 5, Appendix B, Section IV, Part A, Structural and Mechanical Design Development contain detailed information on the structural design.

ECONOMIC ANALYSES

Existing landuse, water supply and demand, projected future without and with project conditions and other base economic data was input into the GIS database by the various agencies involved in the collection and assimilation. The GIS was the major source of data for economic analyses to determine project benefits and costs.

ENVIRONMENTAL ANALYSES

The Memphis District contracted the National Wetlands Inventory (NWI), St. Petersburg, Florida, to digitize their wetland topographic quad maps of the project area. This NWI digital wetland data was then incorporated into the project GIS data base. Since the NWI maps were developed based on interpretation of aerial photography, wetland status at potential project impact sites was verified in the field. Specific NWI wetland types with similar vegetation and hydrology were grouped into broader habitat types (e.g., bottomland hardwood forest, forested swamp, scrub/shrub swamp). Future without- and with-project impacts were projected for all habitat types within the project area. Mitigation requirements necessary to offset losses to wildlife habitat were determined according to Habitat Evaluation System procedures (Appendix C, Section I).

A Section 404(b)(1) evaluation was conducted for the total project, except for the on-farm storage and delivery systems (Appendix C, Section IV). It was assumed that farmers would not construct on-farm systems in wetlands. Any farmers that propose to locate irrigation structures in wetlands will have to apply for an individual Section 404(b)(1) permit. The evaluation involved a review of the project for compliance with the Clean Water Act by applying Section 404(b)(1) guidelines.

A topographic/wetland survey of the White River floodplain was conducted near Clarendon, Arkansas. Wetland communities were defined according to vegetation, soils, and elevation. This baseline information coupled with projected White River hydrologic data was used to assess water withdrawal impacts to floodplain wetlands.

The U.S. Army Waterways Experiment Station conducted a study to determine baseline conditions of and potential project impacts to fisheries (see Appendix C, Section V). This study evaluated project effects of irrigation water withdrawals from the White River on: (1) entrainment of larval fishes, (2) littoral fish assemblages as related to reductions in wetted perimeter, and (3) fish access to contiguous oxbow lakes as related to reductions in stage elevation. Also, project effects on fish habitat of tributary streams and proposed canals that will be utilized to distribute irrigation water were evaluated.

A phase I hazardous, toxic, and radioactive waste assessment was performed according to ER 1165-2-132 (see Appendix C, Section IX). This assessment involved site inspections, analysis of aerial videotapes and photographs, document research, and coordination with appropriate agencies.

An intensive records search and cultural resources survey was conducted along all proposed canal and pipeline alignments. Over 11,000 acres of land were surveyed. The survey found 174 cultural resource sites. Many of these sites are historic, but some are prehistoric. To comply with cultural resource laws, each site must be tested for significance prior to project implementation. Any significant sites that are unavoidable will require data recovery (mitigation) before the project is completed.

STUDY PARTICIPATION & COORDINATION

STUDY MANAGEMENT

The Memphis District Corps of Engineers had the responsibility for planning and project management activities for the general reevaluation effort. A two-tiered management structure consisting of an Executive Committee and a management team was utilized in the managing the study.

EXECUTIVE COMMITTEE

The Executive Committee was responsible for overall study direction and execution which included: commitments on scope, time, cost, resources, and quality; approval of any changes in scope or schedule; and resolution of any disputes between coordinating agencies during the study process. The Committee also participated in interagency coordination, public meetings, information briefings, workshops, and issue resolution conferences; and activities involving Congressional interests; Federal, state and local officials; and public interests.

The Executive Committee consists of the following members:

- ❖ Colonel Daniel Krueger - Memphis District, District Engineer
- ❖ Robert Tisdale - Memphis District, Chief, Deputy District Engineer (Project Management)
- ❖ Tommy Hillman - President, White River Regional Irrigation Water Distribution District
- ❖ Gene Sullivan - Executive Director, White River Regional Irrigation Water Distribution District
- ❖ Kalven Trice - State Conservationist, Natural Resources Conservation Service

STUDY MANAGEMENT TEAM

The study management team was responsible for the day to day management of the general reevaluation. They worked with and directed the work of the interdisciplinary study team. The study management team consisted of a project manager and technical managers. The responsibilities of the project manager as related to general reevaluation report were: monitor physical and fiscal progress of all work required for completion of the project; prepare budgetary submission data and materials; report study progress monthly through the Life Cycle Project Management (LCPM) process and to customer; serve as primary point of contact with potential project sponsor on project issues; participate in preparation of IPMP, issue resolution conferences, study team meetings, and other coordination activities; and prepare Project Management Plan (PMP). The study management team also include a planning technical manager and representatives from the NRCS and WRRIWDD. The planning technical manager responsibilities included: the quality and technical management of all activities including planning, engineering, and real estate products that were a part of the general reevaluation; serving as point of contact on all technical issues; preparation of the IPMP, quality control plan (QCP), and general reevaluation report (GRR); coordination of all technical issues; monitoring of schedule and expenditure of funds for all activities, work elements, and subproducts

for all work necessary for the GRR to assure completion on time and within resources allocated; report progress, issues changes to technical chiefs and project manager; coordination of quality control/quality assurance process including technical review and documentation; and submit draft report (main report & EIS, engineering appendices, real estate memos, etc.) for review and processing. The NRCS technical manager managed all activities associated with the on-farm portion of the project and coordinated this effort with the planning technical manager. The WRRIWDD representative was included in all aspects of planning and project development and assisted in numerous activities. This involvement and coordination was key in the development of a project consistent with the needs and desires of local interests.

INTERDISCIPLINARY STUDY TEAM

An interdisciplinary study team was utilized so that specialists in each discipline would be available to the study effort. The study team also consisted of members from the NRCS and WRRIWDD.

STUDY PARTICIPANTS

Coordination with all study participants and key interests was effected upon receipt of the initial work allowance in December 1991. Initial meeting focused on the development of the IPMP considering the Congressional direction and special instructions received with the work allowance. A scope of studies to achieve the desired study outputs in an efficient and cost effective means was developed with input from all parties.

FEDERAL AGENCIES

(1) The NRCS was a major player throughout the planning process in identification of problems and opportunities, inventory and projection of resources and needs, formulation of alternatives, evaluation of project measures, and planning and design of the on-farm portion of the project.

(2) Results of analyses and modeling studies conducted by the U. S. Geological Service (USGS) during the Eastern Arkansas Region Comprehensive Study were utilized in determining the availability of groundwater. Updated aquifer data from USGS well data was used to confirm previous projections and refine needs to the tract level.

(3) Coordination with the U. S. Fish and Wildlife Service (USFWS) has been continuous throughout the study effort. USFWS is a part of the team that developed and formulated measures to be included as an integral part of the plan to provide additional habitat for waterfowl and fisheries. A Planning Aid Report and Fish and Wildlife Coordination Report are included in Volume 9, Appendix C, Section VI.

STATE AND LOCAL AGENCIES

The Arkansas Soil and Water Conservation Commission (ASWCC), Arkansas Game and Fish Commission (AG&FC), and Arkansas Natural Heritage Commission provided considerable input and support to the study effort. Other agencies involved in coordination include Arkansas Department of Transportation, Arkansas Department of Health, Arkansas Department of Pollution Control and Ecology, Arkansas Department of Parks and Tourism, Arkansas Geological Commission, and Arkansas Waterways Commission.

POTENTIAL PROJECT SPONSOR

The White River Regional Irrigation Water Distribution District (WRIWDD) has been an active participant throughout the study effort.

PUBLIC INVOLVEMENT

An extensive public involvement program was initiated with the receipt of the initial work allowance. Coordination with state and local interests to select the demonstration project site was effected in December 1991. With selection of the Grand Prairie as the demonstration project area, a program was implemented to educate all interests concerning the project and solicit input into the planning process. Public involvement activities included: public information meetings, area shop meetings, individual meetings, state legislative briefings, in-progress reviews and status updates, WRIWDD quarterly meetings, field trips, news releases, information pamphlets, videos, county fair displays, Wings Over the Prairie Festival booth, etc. The initial coordination meeting was conducted with representatives from the WRIWDD and ASWCC on December 10, 1991 in Little Rock, Arkansas. This meeting focused on specific items that required early accomplishment and input from local interests. It was decided that informational meetings for the Irrigation District and local interests could best be conducted after development of the preliminary draft Initial Project Management Plan (IPMP). The following is a list of some of the key public involvement/coordination activities.

<u>DATE</u>	<u>ACTIVITY</u>	<u>PURPOSE</u>
31 Mar 92	Coordination Meeting - LMM, NRCS, WRRIWDD, & ASWCC	Provide progress report and coordinate future work efforts.
8 Dec 92	WRRIWDD Quarterly Board Meeting	In-progress review of study effort.
8 Dec 92	Public Scoping Meeting	WRRIWDD open house meeting to provide information on the general reevaluation and the proposed project, discuss issues and concerns with local interests, and solicit public comments. News releases in area newspapers followed this meeting providing project status.
28 Jan 93	LMM, WRRIWDD, & NRCS Meeting	Preparation for a series of "shop" meetings to be conducted throughout the project area.
21 Jul 93	Briefing	Briefed Governor Tucker on the demo project.
27 Jul 93	Board Meeting	Meeting with WRRIWDD Board of Directors to provide status report and discuss key issues.
30 Aug - 3 Sep 93	"Shop" Meetings	Conducted 7 meetings at strategic locations throughout the project area to key community leaders and farmers for them to communicate and present the project within their area.
18 Nov 93	Coordination Meeting - LMM, USFWS, & NRCS	Discussion of fish & wildlife aspects of the project.
7 Jun 94	Meeting with WRRIWDD	Gene Sullivan hired as Executive Director of WRRIWDD. WRRIWDD to take a more active role in study and project implementation.
18 Jan 94	Formal presentation to Stuttgart Rotary followed by a public information workshop at WRRIWDD office.	Workshop conducted to provide information relative to the project and solicit input into project development.
24-26 Jan 95	Open Meetings at WRRIWDD.	Provide project update. Discuss issues and concerns.
21 Mar 95	Environmental Meeting - LMM, USFWS, AG&FC, U. of AR, etc.	Discuss waterfowl concerns and how waterfowl and fisheries features could be incorporated in the plan.
21 May 96	Meeting with USFWS	Environmental issues and concerns associated with project implementation.

Numerous other coordination meetings were conducted with study participants and interest groups during the study process.

QUALITY CONTROL/QUALITY ASSURANCE

A Quality Control Plan (QCP) was developed to insure that all planning, engineering, and design studies were conducted consistent with Corps guidance and regulations and the final output is a high quality product. The QCP was implemented for independent technical review, consistent with established criteria and procedures, and with policy. Volume 12, Appendix G of this report includes the QCP and supporting documentation for the quality control/quality assurance process.

SPECIAL CONSIDERATIONS

CONGRESSIONAL DIRECTION AND SPECIAL INSTRUCTIONS

Congressional direction contained in the Energy and Water Development Act, 1992 directed that Secretary of the Army through the Corps of Engineers continue preconstruction engineering and design (PED) by selecting and developing implementation plans for one area to serve as a demonstration project. Special instructions provided by HQUSACE with the initial work allowance were as follows:

- ❖ After consultation with local interest, initiate PED by conducting a general reevaluation of one area identified in the draft feasibility report for the Eastern Arkansas Region Comprehensive Study.
- ❖ Submit report to Headquarters for review and approval.
- ❖ No commitment to future actions is to be made.
- ❖ The demonstration shall be the most effective plan.
- ❖ Report progress monthly through the LCPM process.

OTHER CONSIDERATIONS

The planning, engineering and design to determine if a feasible plan of improvement existed and identification of the plan of improvement for proceeding into detailed engineering and design studies was conducted for a project area covering 385,500 acres. Adopted requirements were that all tracts within these boundaries with cultivated cropland would participate in the project and use imported surface water. The boundaries were adjusted twice during the course of the general reevaluation. The first change was the result of a small area north of U. S. Interstate 40 being legally removed from the WRRIWDD and included in the BMRIWDD. No major project design changes were required. Based on system designs and economic optimization this area could best be serviced from the Bayou Meto area via an Arkansas River diversion. The second change resulted indirectly from an Amendment to the Region Water Distribution Act in the 1995 Arkansas General Assembly which provided significant changes in Arkansas water law. This Amendment attempted to remove any obstacles to the development and implementation of the preliminary plan of improvement for the Grand Prairie Area Demonstration Project and, in particular, the functions of the WRRIWDD. Volume 11, Appendix F contains a detailed study of the history and development of Arkansas water law as related to this project. The amendment contained provisions whereby landowners could

petition the Courts to be excluded from the project boundaries. A majority of the landowners in the area south of DeWitt, AR petitioned to be excluded from the District. No final court decision has been made as of this date; however, the WRRIWDD has stated that they will not block their efforts and decided the area should be removed from the demonstration project area. This change resulted in a reduction of required import water and reduced canal sizes in several segments of the delivery system.

Analyses were conducted to resize and optimize project features for the reduced area. Existing data including crop acreages, on-farm storage, and surface acres were adjusted and total demands recalculated. Models were revised and run with the new data with the 1800 cfs pumping station and the new 1640 pumping station. Existing conditions (without import water) were run with the 1640 cfs demand.

PLANNING CONSTRAINTS

GENERAL

This general reevaluation was conducted in accordance with the *Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies*, published in March 1983 by the U. S. Water Resources Council. The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

1. Water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective.

2. Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the Nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed.

3. Plan formulation criteria used was in compliance with the National Environmental Policy Act, Executive Orders 11988 and 11990, and other applicable environmental statutes.

STUDY-SPECIFIC

- ❖ Minimize impacts to White River fisheries.
- ❖ Minimize impact to navigation on White River.
- ❖ Minimize impacts to wetlands and forests.

LEGAL AND INSTITUTIONAL

A major factor in project planning and design was the minimum flow and state water resource allocation requirements for the White River as provided by the current Arkansas State Water Plan (SWP). The requirements of the SWP are presented and discussed in Volume 3, Appendix B, Section I, Water Balance paragraphs 4-A-01 and D-D-01.

PLANNING OBJECTIVES

GENERAL

The planning objectives for the Grand Prairie Area Demonstration Project general reevaluation were developed to formulate plans of improvement consistent with Federal, state and local water and related land resources management needs and goals for the project area. These objectives were developed through problem analysis and in partnership with the White River Regional Irrigation Water Distribution District, the potential project sponsor.

STUDY-SPECIFIC

The following planning objectives were established consistent with and to be responsive to the identified problems and opportunities. These objectives formed the strategies for development of measures for formulation of alternative plans.

- ❖ Protect and preserve the alluvial aquifer.
- ❖ Provide a supplemental water supply to meet the irrigation water needs of the Grand Prairie.
- ❖ Maximize the use of conservation.
- ❖ Enhance fish and wildlife habitat.
- ❖ Restore native prairies.
- ❖ Minimize Cost/Maximize Outputs

ALTERNATIVE PLANS

Alternative plans for the Grand Prairie Area Demonstration Project were formulated to address the planning objectives. A significant amount of data collection, modeling, analyses, and formulation was accomplished in the Eastern Arkansas Region Comprehensive Study and was utilized as the foundation for further development and refinement of alternative plans. Development of the

alternative plans for this project was an iterative process that began at study initiation and continue through the evaluation process. Additions and changes were made to accommodate the many complex issues and constraints and to meet the needs and desires of the local interests.

STRATEGIES

Strategies were developed for solving the water resources problems and opportunities identified and to achieve the goals and objectives. These strategies formed the basis for determination of data and analyses needed to conduct the planning and make decisions relative to the assessment and evaluation of alternative plans.

GROUNDWATER PROTECTION AND PRESERVATION

As previously discussed the most significant problem related to water supply and conservation is the depletion of the alluvial aquifer. Long term stability and prevention of permanent loss of the aquifer were major planning objectives.

AGRICULTURAL WATER SUPPLY

The economy of the Grand Prairie region is almost totally agriculture based and without water for irrigation could not continue to function. A reliable source and supply of water for agricultural irrigation is essential for the future of the region.

CONSERVATION

All available sources of water for agricultural irrigation are limited and must be conserved to the maximum extent feasible. Conservation measures must be an integral part of any plan.

FISH AND WILDLIFE RESTORATION

The Grand Prairie area is one of the premier duck hunting areas in the world. The project offers significant opportunity to restore habitat for fish and wildlife and enhance the environment.

MEASURES

The following measures are the specific actions or features identified to address the planning objectives.

IRRIGATION EFFICIENCIES

The efficiency of delivering and applying water to the crops being irrigated is an important factor in determining the water needed and optimizing project design. Irrigation efficiency is defined as the amount of applied water that benefits the crop divided by the total amount of water leaving the

on-farm source. It is an indicator of the water loss due to levee seepage, evaporation, deep percolation, tailwater runoff, and waste. Studies conducted by the Natural Resources Conservation Service (NRCS) have shown that installation of water conservation practices and water management techniques can improve water application efficiencies. These conservation measures include land leveling, soil moisture monitoring and irrigation scheduling programs, tailwater recovery systems, application methods (sprinkler, drip, furrow, etc.), and utilization of pipelines for on-farm water transfer. By increasing the efficiency of getting the water from the on-farm source to the field, conservation measures effectively cut the demand and should be maximized to the extent practical.

Extensive field tests and analyses were conducted by NRCS for the Eastern Arkansas Water Conservation Project (EAWCP) to determine existing and potential irrigation efficiencies of typical farms throughout eastern Arkansas. This project included 20 season long studies on flood rice irrigation and 25 evaluations on other crops using intermittent flood irrigation. An irrigation water needs analysis was performed which determined the irrigation efficiencies of the typical farm for rice and other crops. Findings from these studies showed that current average irrigation efficiencies for the Grand Prairie region are approximately 60 percent. Field tests were conducted to determine the achievable efficiencies using conservation practices. Land leveling was not considered for the Grand Prairie area due to the near flat topography and the fact that most land has or is being leveled to the extent feasible. Conservation analysis on typical cells and comparison of benefits and costs showed that an improvement of about 10% in irrigation efficiency can realistically be achieved. Economic analyses (Volume 10, Appendix D, Section III, Table D-III-35) confirmed that conservation provides the best return per dollar invested. Therefore, the with project demands for the Grand Prairie Demonstration Project were based on a project wide 70% efficiency in water applications.

GROUNDWATER

Utilizing the digital groundwater flow model of the alluvial aquifer developed and calibrated by the U. S. Geological Survey to evaluate the effects of future pumping on the saturated thickness of the aquifer; Dr. Richard C. Peralta, University of Arkansas, conducted an optimal conjunctive use - sustained yield pumping analysis for the eastern Arkansas area. This analysis included the development of a optimization/simulation model. The water management model maximized the available surface water resources and sustained groundwater yield. Optimal strategies for time-varying demands over a 50 year period were developed and analyzed. These strategies were run with and without conservation measures. Physically available water was insufficient to satisfy the water demand in any scenario. The unsatisfied demand was the difference of the total demand and optimal available water. The unsatisfied demand can only be met by importing water from other sources. A monthly allocation model was developed for the cropping season to better quantify the timing of specific irrigation needs.

The Peralta model provided an annual volume (ac-ft/yr) of available groundwater for a 3X3 square mile cell or 5,760 acres. This was the maximum amount of groundwater pumpage that would sustained the aquifer and allow for recharge at a rate greater that pumpage. This volume was used as a base condition in development of a water budget model. The unit safe yield was computed for

each cell by dividing the safe yield for that cell by 5,760 acres (ac-ft/yr/ac). The available groundwater for each tract was computed by multiplying the unit safe yield of the cell by the irrigated acres on the tract. This estimate was considered a conservative value and would allow for recharge of the area over a long term period of time.

ON-FARM STORAGE

On-farm storage is a practical means of capturing and storing additional surface water for irrigation purposes. Farmers throughout eastern Arkansas and particularly in the Grand Prairie area have depended on their storage reservoirs to provide the irrigation water they needed when all other sources were exhausted. On-farm reservoirs provide the means for capturing runoff throughout the year from existing streams during periods of high flow or storm events and to recapture irrigation water runoff. On-farm storage provides that large volume of water needed for initial flooding of rice fields and timely irrigation of other crops. Studies conducted by NRCS Conservation Districts have shown that yields are substantially increased if water is applied at specific points in the plants growth and development cycle. On-farm storage now provides approximately 14 percent of the irrigation water in the Grand Prairie area. There are currently 15,566 acres of land in the Grand Prairie area in storage reservoirs. These reservoirs provide 84,525 ac-ft of irrigation water annually. The existing sources of available water for capture currently limit on-farm storage.

Analyses were conducted to determine the optimum amount of storage. These analyses considered: the peak water need periods, the amount of land that a farmer would be willing to take out of production, the availability of import water during peak use times, and the increased available water for capture and storage with the implementation of conservation measures. Numerous storage levels were run and evaluated. Initial storage levels were analyzed to minimize the peak demand on the delivery system. This would minimize the size of the delivery system (pumping station, canals, structures, etc.) and allow a more constant operation for the delivery system. The optimum level of storage was determine to be approximately 25% of existing or 31% of the with project decreased needs for an average year. The decreased needs are a result of conservation. This level was achieved through balancing the availability of import water, timing of irrigation, filling reservoirs, and providing water for fish and wildlife. This would required 8,849 acres of land and would provide 88,493 ac-ft of additional irrigation water annually. All reservoirs would be placed on cropland. Storage levels below this level would require the conversion of irrigated land to dry land farming. This level is recommended based on supply-demand modeling and an economic tradeoff analysis. An increase or decrease in storage reduces the net economic benefits. Storage water is utilized throughout the cropping season on an as-needed and as-available basis, when other sources fail to meet the demands.

IMPORT WATER

The unmet need was the volume of water that could not be met with existing sources: groundwater, surface water, rainfall, storage, etc. This unmet need would have to come from outside sources. The total volume of import water needed is the decreased demand after implementation of conservation measures less tailwater capture less available storage less groundwater pumpage at

sustainable level. The major concern related to import water was a source that could supply this volume of water at the time needed.

The only source of import water within the region that could provide the need was the White River and flows in the White River fluctuate substantially throughout the year. A water balance analysis (Volume 3, Appendix B, Section I) was conducted which considered all sources and agricultural uses of water. Factors affecting the water balance included White River discharge, rainfall, evaporation, on-farm storage, groundwater, import system capacity, delivery system losses, and water demand. Determining the amount of water available from the White River and the delivery system's ability to supply the required water was key in evaluating project functionality and feasibility. The water balance was conducted using HEC-5 for a 47 year period of record. Water balance simulations were conducted for seven minimum flow conditions on the White River. Flow was considered available for diversion when discharges were greater than the minimum requirements for any other use or stop pump level. These seven minimum in-stream flow conditions were used to determine the optimum pump cut-off level. However, the minimum instream flow requirements of the Arkansas State Water Plan (SWP) were determined to be the governing constraint. The water balance model provided the water available for diversion, flowrate of pumping station, residual flow remaining in the White River, storage volume utilization, and water demand met on a daily basis. Water supplied was sufficient to meet all demands approximately 87.6 percent of the time. All of the demands were met during some years.

FLOODING FOR WATERFOWL

The project area is along a major migratory route for ducks and geese. A major need identified by wildlife biologists is additional waterfowl feeding and resting areas along this route, particularly in eastern Arkansas. A plan to provide additional waterfowl habitat within the project area was developed by a coalition of Federal, state and private agencies. This project feature was developed as a "joint venture" under the auspices of the North American Waterfowl Management Plan. Water needed for flooding for waterfowl was based on a 45,000 acre target for the Grand Prairie area identified in the North American Waterfowl Agreement. Required flooding depths were estimated by environmental specialists to be an average of 4 inches. The goal, dependent upon available water, was to annually flood 45,000 acres of harvested fields and annually manage up to 30,000 additional acres to impound rain water. The need for this water is from mid-October to the end of November.

FISH HABITAT

Within the project area, only limited fisheries exist in many of the small tributary streams due to desiccation during summer months. The Grand Prairie Area Demonstration Project provides opportunities to enhance fisheries in these tributaries and create fisheries within new canals. Weirs placed in existing streams for irrigation purposes will provide pools of sufficient depth to maintain year round fisheries. New canals and storage reservoirs will also provide additional fish habitat.

PRAIRIE RESTORATION

Since this region once contained a vast tallgrass prairie, native prairie grasses (i.e. big bluestem, little bluestem, Indiangrass, switchgrass, etc.) and possibly some prairie forbs will be planted within the rights-of-way of the proposed irrigation canals. The potential planting are within these rights-of-way totals approximately 3,000 acres, affording an opportunity to increase substantially the amount of prairie within the project area. However, prairie restoration can be costly and time consuming. Therefore, experimental planting of the prairie grasses will be conducted to determine the appropriate planting methodology and associated costs. Results of this experimentation will be used to ascertain the feasibility and amount of restoration practical.

ALTERNATIVES

Numerous structural and non-structural measures were considered and evaluated in the formulation of alternative plans. Measures which had been determined either not feasible, unacceptable, or did not meet the needs of the area during feasibility studies were not considered in the general reevaluation. These measures included groundwater artificial recharge, intensified mining of deeper aquifers, reallocation of storage in the White River reservoirs and construction of large reservoirs. Engineering, environmental, economic, sociological, institutional, acceptability, and other factors were key in the formulation of alternatives to insure that resources were not wasted in the development of unimplementable plans.

The following is a presentation of alternatives developed for the Grand Prairie Area Demonstration Project. Some of the alternatives were carried forward through complete and detailed engineering, economic, and cost analyses. Others were screened or eliminated from detailed studies at various points throughout the planning process. Formulation of alternative plans and optimization of project measures were initially accomplished for a project area consisting of 394,475 acres (281,980 cropland - 273,969 irrigated). As previously discussed the project area was reduced by approximately 11% to a project area of 362,662 acres (254,406 cropland - 247,556 irrigated). Alternatives for the original project area are denoted with an A while the modified project area by B (example, Alternatives 1A and 1B). Several of the original project area's alternatives that contained an import system were analyzed with various withdrawal limitations on the White River. The modified project area's alternatives were analyzed with the limitations of the current Arkansas state law on withdrawals from the White River. All alternatives were based on groundwater providing approximately 35,574 acre-feet annually, the long-term sustained yield of the alluvial aquifer from groundwater studies which will allow recharge.

ALTERNATIVE 1 - NO ACTION

This alternative is the set of conditions that are expected to occur in the proposed project area in the absence of a project. The supply of irrigation water is expected to decrease significantly as the groundwater aquifer is depleted, Figure 4. Historical and current trends reaffirmed by well data and

field observation by NRCS and local farmers in conjunction with results of extensive groundwater modeling studies of eastern Arkansas as previously discussed show that even the latest projections are conservative. However, before the aquifer is completely exhausted and in order to preserve the aquifer for future generations it is likely that the state of Arkansas will designate this area as "critical groundwater area" at which point withdrawals would likely be limited to the annual recharge rate. Legal and institutional restrictions would then become the governing factor instead of physical constraints. Existing on-farm storage reservoirs, capture of rainfall, and recovery of irrigation water are projected to remain unchanged. The desired land use and demand for irrigation water in the future will remain the same as present conditions; however, it is expected that only about 22% of the project area can be irrigated during an average year. This alternative includes the installation of on-farm practices and storage reservoirs utilizing existing farm programs to improve efficiencies and reduce water needs. Alternative 1 was carried through detailed hydrologic and economic analyses and used as the base with which to compare the effects of all other alternatives. The hydrologic and economic analyses for Alternative 1 were conducted for the original and modified project areas. These two investigations are defined as: Alternative 1A for the original project area and Alternative 1B for the modified project area.

ALTERNATIVE 2 - STORAGE ONLY

An alternative to construct additional on-farm storage reservoirs without an import system or conservation measures was evaluated. Initial hydrologic modeling indicated that irrigation water available for use on the farm might actually decrease if additional reservoirs were built without any source for additional supply. This analysis showed that farmers in the Grand Prairie are currently capturing the maximum amount of rainfall physically possible without the implementation of other measures. Building more reservoirs would not allow existing reservoirs to be filled to capacity and would increase evaporation and infiltration losses as the water is spread out over more surface acreage. Since additional reservoirs could only be filled in extremely wet years without import water and since this alternative does not meet the planning goals and objectives, it was deleted from further study.

ALTERNATIVE 3 - CONSERVATION WITH STORAGE

Alternative 3 consists of conservation measures without any import water. Conservation measures would be implemented to maximize the use of existing water sources to the extent practical. These measures are designed to increase the efficiency or usage of irrigation water. As previously discussed in a previous section on irrigation efficiencies, the current 60% efficiency rate would be increased to 70% through the installation of conservation measures. With this alternative the availability of existing runoff for capture would limit new reservoir construction to 1379 acres and conservation measures could only be placed on approximately 31 percent of the area's current irrigated acreage. This means that when groundwater is depleted or regulated at the safe yield only about 31 percent of the area could remain in irrigation in the absence of some form of supplemental source of irrigation water. The remainder of the area would convert to dryland agriculture. Analyses

for Alternative 3 were conducted for the original and modified project areas and defined as: Alternative 3A for the original project area and Alternative 3B for the modified project area.

ALTERNATIVE 4 - IMPORT SYSTEM & CONSERVATION WITHOUT ADDITIONAL STORAGE

Alternative 4 includes the conservation features (excluding additional on-farm storage reservoirs) described in Alternative 3 in conjunction with an import system which diverts water from the White River. It would use import water to fill existing on-farm reservoirs during the non-crop season and provide water directly to the field during the crop season. Studies conducted by NRCS showed that the desired conservation efficiencies could not be achieved without additional storage. This alternative was dropped from further consideration since previous studies and analyses have shown that conservation is the measure that yields the most return for the dollar invested and should be included in any plan developed.

ALTERNATIVE 5 - COMBINATION CONSERVATION, STORAGE AND IMPORT WATER

This alternative consists of a combination of conservation measures, on-farm storage, and an 1800 CFS import system. As in Alternative 3, on-farm storage will provide approximately 25% of the existing irrigation needs or 30% of with-project needs reduced by conservation. Again conservation measures are designed to achieve the optimum level increasing the irrigation efficiencies from 60% to 70% for the entire project area. On-farm storage is used to capture existing runoff and to store import water for use during peak demand periods or when other sources cannot provide the need. Import water is provided by transfer of excess water from the White River to the farms through a system of new canals, existing streams, and pipelines. These three components are not independent or stand alone features. They are related and depend on each other to function properly. Analyses for Alternative 5 were conducted for the original and modified project areas and designated as: Alternative 5A for the original project area and Alternative 5B for the modified project area.

Alternative 5A requires 9,790 acres of new on-farm storage supplying 97,900 acre-feet. Alternative 5B requires 8,849 acres supplying 88,493 acre-feet. Alternative 5A was further analyzed at various stop pump levels or withdrawal limitations on the White River to demonstrate that the most efficient level was identified. These withdrawal or stop pump levels include the current Arkansas State Water Plan (variable rate) and the following flows measured in cubic feet per second (CFS): 5,250; 7,125; 9,650; 11,350; 12,850; and 17,500. A detailed discussion of this analysis is included in the impacts assessment for the White River (Volume 3, Appendix B, Section I, Part D, Topic D, White River and Volume 10 Appendix D, Section III, Optimization of On-Farm Features and White River Withdrawals). The stop pump or residual flows in the White River in conjunction with this alternative are as follows:

- ❖ Alternative 5A(1) - 5,250 CFS residual flow
- ❖ Alternative 5A(2) - 7,125 CFS residual flow
- ❖ Alternative 5A(3) - 9,650 CFS residual flow
- ❖ Alternative 5A(4) - 11,350 CFS residual flow
- ❖ Alternative 5A(5) - 12,850 CFS residual flow
- ❖ Alternative 5A(6) - Current Arkansas State Water Plan
- ❖ Alternative 5A(7) - 17,500 CFS residual flow

Alternative 5B was analyzed for the Current Arkansas State Water Plan, (6) above, only. The results of analyses for Alternative 5A indicated that it was economically viable to withdraw excess flows down to the 5,250 to 7,125 range. However, it was recognized that since current Arkansas state law limits the potential withdrawals, this institutional constraint should be used as the maximum withdrawal for comparing the effects of all alternatives.

ALTERNATIVE 6 - COMBINATION ALTERNATIVE PLUS ADDITIONAL STORAGE

Alternative 6 consists of the conservation features and 1,800 cfs import system in Alternative 5 above. The difference is that new on-farm storage is increased an additional 25%. Alternative 6 for the original and modified project areas was designated as Alternative 6A for the original project area and Alternative 6B for the modified project area.

Alternative 6A requires an additional 2,448 acres of on-farm storage for a total of 12,238 acres of new storage and supplies 122,380 acre-feet. Alternative 6B requires an additional 2,212 acres for a total of 11,061 acres of new storage and supplies 110,610 acre-feet. Alternative 6A was analyzed for the same array of stop-pump scenarios as Alternative 5A designated as follows:

- ❖ Alternative 6B(1) - 5,250 CFS residual flow
- ❖ Alternative 6B(2) - 7,125 CFS residual flow
- ❖ Alternative 6B(3) - 9,650 CFS residual flow
- ❖ Alternative 6B(4) - 11,350 CFS residual flow
- ❖ Alternative 6B(5) - 12,850 CFS residual flow
- ❖ Alternative 6B(6) - Current Arkansas State Water Plan
- ❖ Alternative 6B(7) - 17,500 CFS residual flow

A comparison of Alternatives 5A and 6A revealed that increase levels of on-farm storage above the optimum level identified in studies by the NRCS were not economically feasible. Any increased benefit provided by additional storage was more than offset by the added cost of building the storage. Based on these results, detailed analyses was not conducted for Alternative 6.

ALTERNATIVE 7 - IMPORT SYSTEM OPTIMIZATION

The prior alternatives were developed and used to optimize the on-farm features of the project (conservation measures and on-farm storage). All prior alternatives used an 1,800 CFS import system which was the hydrologic optimum for satisfying an average year's demands for the original project area with unlimited withdrawals from the White River. However, the White River cannot support unlimited withdrawals due to low flows and the institutional constraints of current state law which was put in place to protect all users. Because of these constraints, it was necessary to look at an array of import system sizes to show that the optimum import system was chosen from an economic standpoint. The on-farm components of Alternative 7 were held constant at the 70 percent conservation level while on-farm storage was held constant at 8,949 acres (88,490 acre-feet) of new reservoirs. Only the import system is allowed to vary for Alternative 7. The following four alternatives were analyzed under the Current Arkansas State Water Plan and were designated as:

- ❖ Alternative 7A -- 1,480 CFS import system
- ❖ Alternative 7B -- 1,640 CFS import system
- ❖ Alternative 7C -- 1,800 CFS import system
- ❖ Alternative 7D -- 1,960 CFS import system

SCREENING OF ALTERNATIVES

Alternatives 2 and 4 were screened or eliminated from detailed analysis and/or refinement at an early stage of the study process. Alternative 2 is the amount of additional on-farm storage that could be filled using existing sources of surface water. Preliminary studies by NRCS had indicated that existing water sources with increased conservation could support approximately 1,400 surface acres of additional storage. Further modeling by the Memphis District indicated that irrigation water available to the farms might actually decrease if more reservoirs are built. This modeling showed that the farmers within the Grand Prairie region are already capturing the maximum amount of rainfall physically possible. Building more reservoirs would increase evaporation and infiltration losses as the water is spread over more surface acreage. Since it is questionable whether the reservoirs could be filled without an import system and since this alternative does not meet the objectives of the study, it was not carried forward into detailed study.

Alternative 4 used only the existing level of on-farm storage (no additional storage) in conjunction with the import system. After consultation with NRCS, it was determined that the desired conservation efficiencies could not be achieved without building new reservoirs. Since all previous studies (Corps feasibility study and preliminary PED study and NRCS studies) have shown that conservation yields the most return for the dollar invested, this alternative was eliminated before going into detailed study. Any economic contributions made by it would be more than offset by the economic losses associated with the lost conservation efficiencies.

REFINEMENT OF ALTERNATIVES

Initially three alternatives were carried into detailed analysis. They were Alternatives 3, 5, and 6. Alternative 3 (conservation and storage without the import system) yields a higher dollar return for each dollar invested than any single or combination of measures. Its measures should always be used to the maximum or optimum extent before adding any other measure since it provides water more cost effectively than any other source. However, conservation cannot supply all of the Grand Prairie area's future without-project unmet need. The limiting factor in using conservation measures is that they are effective only when there is available water to recover. A point is quickly reached where the available sources of irrigation water are exhausted and only a small portion of an average year's unmet need can be satisfied. Conservation practices are recommended to be used over the entire project area in conjunction with the alternative sources provided by other alternatives, since conservation reduces the total amount of water required and is more cost effective. Because of this, the features in Alternative 3 were incorporated into the design of Alternatives 5 and 6.

Alternatives 5 and 6 incorporated the conservation measures of Alternative 3 and two storage levels along with an 1,800 cfs pump station and import system. This size import system is the minimum required to supply an average year's unmet demand based on unlimited withdrawals from the White River. Alternative 5 is the minimum level of on-farm storage necessary to achieve Alternative 3's desired conservation levels for the entire project area. Any decrease would reduce the conservation efficiencies and cause a corresponding shift from irrigation to dryland practices during an average year. It calls for the construction of 9,790 surface acres off new reservoirs providing approximately 97,900 acre-feet of storage. This volume will satisfy approximately 25 percent of existing irrigation needs or about 30 percent of with-project needs which are reduced by conservation measures. Any cost savings from reducing on-farm storage below this level would be more than offset by the economic losses associated with the lost conservation efficiencies. Alternative 6 called for increasing the on-farm storage reservoirs in Alternative 5 by 25% for an additional 2,448 surface acres or a total of 12,238 additional reservoirs. These additional reservoirs were found not to be incrementally economically justified.

Alternatives 5 and 6 also used an array of operating methods or withdrawal limitations on the White River. The smallest limitation was shown to be the most desirable from an economic standpoint. However, current Arkansas State law prohibits withdrawals below the instream flow requirements established in the Arkansas State Water Plan (SWP). This institutional or legal limit can only be changed with legislation. Based on this constraint and the recommendations of the state of Arkansas, the operation plan that disallowed any withdrawals below the established limits set forth in the SWP was adopted as the operation plan for project design and analyses. Operation plans that further increase withdrawal limitations (or reduce withdrawals) over the Arkansas SWP, reduce the project benefits greater than any reductions of potential adverse effects or costs and as such are not recommended for adoption.

At this point the conservation and on-farm storage levels of Alternative 5 were determined to be optimized. Their optimum levels are established and no further study is required to support

their selection. The supporting economic data is presented in Table 5. However, further analysis is required to identify the optimum import system size. These features were recommended to be carried into the final array of plans along with the withdrawal limitation coinciding with the current Arkansas SWP to determine the optimum import system size.

Table 5.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Summary of Annual Benefits, Costs, Excess Benefits, and Benefit-Cost Ratios
(October 1995 Price Levels, 7.75% Discount Rate, \$000)

Alternative	Annual Benefit	Annual Cost	Excess Benefit	Benefit-Cost Ratio
3A	5,949	2,959	2,990	2.01
5A(1)	66,448	47,361	19,087	1.40
5A(2)	66,332	47,349	18,983	1.40
5A(3)	64,760	47,209	17,551	1.37
5A(4)	62,197	47,000	15,197	1.32
5A(5)	58,838	46,630	12,208	1.26
5A(6)	54,538	46,027	8,511	1.18
5A(7)	49,213	45,552	3,661	1.08
6A(1)	66,782	49,163	17,619	1.36
6A(2)	66,679	49,151	17,528	1.36
6A(3)	65,081	49,011	16,070	1.33
6A(4)	62,576	48,806	13,770	1.28
6A(5)	60,334	48,445	11,889	1.25
6A(6)	54,764	47,849	6,915	1.14
6A(7)	49,894	47,381	2,513	1.05

FINAL ARRAY OF ALTERNATIVE PLANS

Alternative 7 incorporates the optimum features identified during the refinement process along with four pump station and import system sizes. These four alternatives were analyzed under the Current Arkansas State Water Plan. The four alternatives are:

- ◆ Alternative 7A -- 1,480 CFS import system
- ◆ Alternative 7B -- 1,640 CFS import system
- ◆ Alternative 7C -- 1,800 CFS import system
- ◆ Alternative 7D -- 1,960 CFS import system

These four sizes were used to bracket and select the optimum import system size. The 1,640 cfs system (Alternative 7B) was identified as the optimum plan. It is the optimum size from two standpoints. The first is the project's capability to supply an average year's unmet demand. Hydrologic modeling confirmed its features to be the minimum required to meet an average year's unmet demand with unlimited flows from the White River. The second is optimization from an economic standpoint which examines the trade-offs associated with meeting the unmet demands with limited flows from the White River. Alternative 7B maximizes the excess benefits over costs and therefore is the optimum or NED plan. The economic trade-offs are presented in Table 6.

Table 6.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Summary of Annual Benefits, Costs, Excess Benefits, and Benefit-Cost Ratios
Alternatives 7A-D
 (October 1996 Price Levels, 7.375% Discount Rate, \$000)

Alternative	Annual Benefit	Annual Cost	Excess Benefit	Benefit-Cost Ratio
7A	35,290	28,512	6,778	1.2
7B	36,132	29,256	6,876	1.2
7C	36,744	29,974	6,770	1.2
7D	37,331	30,689	6,642	1.2

TRADE-OFF ANALYSES

This section of the report focuses on the differences between the alternative plans presented in the final array based on the effects in the NED, EQ, RED, and OSE accounts. The plan with the greatest net economic benefits consistent with protecting the nation's environment would be selected, unless deviation is justified on the basis of trading off contributions of the other plans. Several factors were considered as trade-offs during plan formulation. These considerations are discussed in previous sections and include: (1) the amount of on-farm storage and conservation versus import water; (2) the demand for White River flows by various users; and (3) the short term impacts of construction and the overall net increase in benefits to fish and wildlife habitat and the environment.

NED ACCOUNT

Table 7, System of Accounts, indicates that all four of the alternatives in the final array are economically justified. All plans contribute more to the national economy in the way of direct or primary benefits than they would cost to build, operate, and maintain. Annual benefits include benefits from agricultural irrigation, NED employment, and waterfowl. Alternative 7B is identified as the NED plan since it maximizes excess benefits over costs. It provides in excess of \$36 million dollars in annual benefits at an annual cost of slightly over \$29 million. Its excess benefits over costs are \$6.9 million with a benefit-to-cost ratio of 1.2 to 1.

EQ ACCOUNT

Within the project area there are both rural and urban lands. However the project primarily affects the rural lands. Most of the rural lands affected by the project are cleared and intensively farmed. There are significant positive contributions to the EQ account by all alternatives as shown in Section C of Table 7, System of Accounts. They would provide significant wildlife and aquatic habitat and have no effect on any threatened or endangered species. The most significant adverse effects would result from the clearing of 245 acres of valuable wildlife habitat. One hundred eighteen acres of habitat would be lost to project features; and 127 acres would be cleared, but allowed to regenerate following construction.

RED ACCOUNT

The System of Accounts shows that all alternatives contribute positively to the RED account. They prevent the erosion of the economy's agricultural base by sustaining irrigation and maintaining employment. They contribute positively to local government finances by preventing widespread declines in property values (tax base). There is a positive contribution to local employment during construction of the project and from operation and maintenance activities over the life of the project. There are also other secondary or spin-off effects which have not been quantified in the account but nevertheless are real, affecting area lending institutions, farm supply retailers, equipment dealerships, and other firms where those employed by the agricultural sector of the local economy spend their wages.

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
A. PLAN DESCRIPTION	1,480 CFS Import System	1,640 CFS Import System	1,800 CFS Import System	1,960 CFS Import System
B. NATIONAL ECONOMIC DEVELOPMENT				
1. First Cost	\$264,003,000	\$270,512,000	\$277,022,000	\$283,531,000
2. Annual Benefits	\$35,290,000	\$36,132,000	\$37,744,000	\$37,331,000
3. Annual Costs	\$28,512,000	\$29,256,000	\$29,974,000	\$30,689,000
4. B/C	1.2	1.2	1.2	1.2
C. ENVIRONMENTAL QUALITY				
1. Biological Resources				
a. Wildlife Habitat				
(1) Beneficial Effects	38,234 acres of flooded, harvested rice fields on an average annual basis; 22,213,954 duck-use-days (DUDs) per annum.	38,525 acres of flooded, harvested rice field on an average annual basis; 22,383,025 DUDs per year.	38,766 acres of flooded, harvested rice field on an average annual basis; 22,523,046 DUDs annually.	39,128 acres of flooded, harvested rice fields on an average annual basis; 22,733,368 DUDs annually.
(2) Adverse Effects	245 acres of valuable habitat impacted; loss of 104 annualized habitat unit values.	Same as Alternative 7A.	Same as Alternative 7A.	Same as Alternative 7A.

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
b. Aquatic Resources				
(1) Beneficial Effects	Benefits to tributary streams would be 4,328 fishery habitat units (HUs)/month; 8,560 HUs/month provided by new irrigation canals.	Same as Alternative 7A.	Same as Alternative 7A.	Same as Alternative 7A.
(2) Adverse Effects	Minimal impact to White River aquatic resources.	Similar to Alternative 7A.	Similar to Alternative 7A.	Similar to Alternative 7A.
c. Threatened or Endangered Species				
(1) Beneficial Effects	No Effect	No Effect	No Effect	No Effect
(2) Adverse Effects	No Effect	No Effect	No Effect	No Effect
2. Air Quality				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	Construction Will Result in a Temporary Decrease in Air Quality due to Dust and Exhaust Emissions	Construction Will Result in a Temporary Decrease in Air Quality due to Dust and Exhaust Emissions	Construction Will Result in a Temporary Decrease in Air Quality due to Dust and Exhaust Emissions	Construction Will Result in a Temporary Decrease in Air Quality due to Dust and Exhaust Emissions
3. Water Quality				
a. Beneficial Effects	Slight Benefits to Tributary Streams and Farmland	Slight Benefits to Tributary Streams and Farmland	Slight Benefits to Tributary Streams and Farmland	Slight Benefits to Tributary Streams and Farmland
b. Adverse Effects	Construction Will Cause a Temporary Increase in Erosion and Turbidity	Construction Will Cause a Temporary Increase in Erosion and Turbidity	Construction Will Cause a Temporary Increase in Erosion and Turbidity	Construction Will Cause a Temporary Increase in Erosion and Turbidity

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
4. Wooded Land				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way
5. Agricultural Land				
a. Beneficial Effects	Irrigation Will Be Maintained Which Will Prevent a Significant Decrease in Agricultural Production, Land Values, and Tax Base	Irrigation Will Be Maintained Which Will Prevent a Significant Decrease in Agricultural Production, Land Values, and Tax Base	Irrigation Will Be Maintained Which Will Prevent a Significant Decrease in Agricultural Production, Land Values, and Tax Base	Irrigation Will Be Maintained Which Will Prevent a Significant Decrease in Agricultural Production, Land Values, and Tax Base
b. Adverse Effects	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way	Slight Loss in Lands Required for Construction Rights-Of-Way
6. Prime and Unique Farmlands				
a. Beneficial Effects	No Significant Effect	No Significant Effect	No Significant Effect	No Significant Effect
b. Adverse Effects	No Significant Effect	No Significant Effect	No Significant Effect	No Significant Effect
7. Wetlands				
a. Beneficial Effects	Could Halt or Slow Desiccation of Groundwater Wetlands Along White River	Could Halt or Slow Desiccation of Groundwater Wetlands Along White River	Could Halt or Slow Desiccation of Groundwater Wetlands Along White River	Could Halt or Slow Desiccation of Groundwater Wetlands Along White River
b. Adverse Effects	121 Acres Adversely Impacted by Construction of the Delivery System	121 Acres Adversely Impacted by Construction of the Delivery System	121 Acres Adversely Impacted by Construction of the Delivery System	121 Acres Adversely Impacted by Construction of the Delivery System

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
8. Historic Properties				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect
D. REGIONAL ECONOMIC DEVELOPMENT				
1. Income				
a. Beneficial Effects	\$36,513,000	\$37,385,000	\$38,027,000	\$38,644,000
b. Adverse Effects	\$28,512,000	\$29,256,000	\$29,974,000	\$30,689,000
2. Employment				
a. Beneficial Effects	Prevents Significant Loss of Jobs in Local Economy due to Lost Revenue when Agriculture moves from Irrigated to Dryland Practice as the Aquifer is Depleted	Prevents Significant Loss of Jobs in Local Economy due to Lost Revenue when Agriculture moves from Irrigated to Dryland Practice as the Aquifer is Depleted	Prevents Significant Loss of Jobs in Local Economy due to Lost Revenue when Agriculture moves from Irrigated to Dryland Practice as the Aquifer is Depleted	Prevents Significant Loss of Jobs in Local Economy due to Lost Revenue when Agriculture moves from Irrigated to Dryland Practice as the Aquifer is Depleted
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect
3. Regional Growth				
a. Beneficial Effects	No New Growth but Prevents Decline When the Groundwater Resources are Exhausted and Agricultural Revenue Decreases	No New Growth but Prevents Decline When the Groundwater Resources are Exhausted and Agricultural Revenue Decreases	No New Growth but Prevents Decline When the Groundwater Resources are Exhausted and Agricultural Revenue Decreases	No New Growth but Prevents Decline When the Groundwater Resources are Exhausted and Agricultural Revenue Decreases
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
4. Local Government Finance				
a. Beneficial Effects	Prevents Decrease in Property Values and Tax Base is Maintained	Prevents Decrease in Property Values and Tax Base is Maintained	Prevents Decrease in Property Values and Tax Base is Maintained	Prevents Decrease in Property Values and Tax Base is Maintained
b. Adverse Effects	No Effect Since Local Government Will Not Finance or Maintain the Project	No Effect Since Local Government Will Not Finance or Maintain the Project	No Effect Since Local Government Will Not Finance or Maintain the Project	No Effect Since Local Government Will Not Finance or Maintain the Project
E. OTHER SOCIAL EFFECTS				
1. Noise				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	Increased Noise Level During Construction	Increased Noise Level During Construction	Increased Noise Level During Construction	Increased Noise Level During Construction
2. Aesthetics				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Significant Effect	No Significant Effect	No Significant Effect	No Significant Effect
3. Health and Safety				
a. Beneficial Effects	Helps Protect and Sustain Alluvial Aquifer	Helps Protect and Sustain Alluvial Aquifer	Helps Protect and Sustain Alluvial Aquifer	Helps Protect and Sustain Alluvial Aquifer
b. Adverse Effects	Increase in Injuries During Project Construction and Maintenance	Increase in Injuries During Project Construction and Maintenance	Increase in Injuries During Project Construction and Maintenance	Increase in Injuries During Project Construction and Maintenance

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
4. Displacement of People				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect
5. Community Cohesion				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect
6. Emergency Preparedness				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect
7. Recreational Opportunities				
a. Beneficial Effects	Provides Approximately 20,834 Additional Acres of Waterfowl Habitat for Hunting Purposes	Provides Approximately 21,129 Additional Acres of Waterfowl Habitat for Hunting Purposes	Provides Approximately 21,366 Additional Acres of Waterfowl Habitat for Hunting Purposes	Provides Approximately 21,728 Additional Acres of Waterfowl Habitat for Hunting Purposes
b. Adverse Effects	No Significant Effect	No Effect	No Effect	No Effect
8. Real Income Distribution				
a. Beneficial Effects	No Effect	No Effect	No Effect	No Effect
b. Adverse Effects	No Effect	No Effect	No Effect	No Effect

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
F. PLAN EVALUATION				
1. Tangible Benefits	\$36,513,000	\$37,385,000	\$38,027,000	\$38,644,000
2. Tangible Costs	\$28,512,000	\$29,256,000	\$29,974,000	\$30,689,000
3. Net Benefits	\$8,001,000	\$8,129,000	\$8,053,000	\$7,955,000
4. B/C Ratio	1.3	1.3	1.3	1.3
G. IMPLEMENTATION RESPONSIBILITY				
1. Financial First Cost				
a. Non-Federal	To be determined.	To be determined.	To be determined.	To be determined.
b. Federal	To be determined.	To be determined.	To be determined.	To be determined.
c. Total	\$264,003,000	\$270,512,000	\$277,022,000	\$283,531,000
2. Annual Investment Charge				
a. Non-Federal	To be determined.	To be determined.	To be determined.	To be determined.
b. Federal	To be determined.	To be determined.	To be determined.	To be determined.
c. Total	\$23,898,000	\$24,478,000	\$25,057,000	\$25,636,000
3. Annual OM&R				
a. Non-Federal	\$4,481,000	\$4,639,000	\$4,773,000	\$4,905,000
b. Federal	\$0	\$0	\$0	\$0
c. Total	\$4,481,000	\$4,639,000	\$4,773,000	\$4,905,000

Table 7.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
System of Accounts
(October 1996 Price Levels, 7.375 Percent Discount Rate)

Account	Alternative 7A	Alternative 7B	Alternative 7C	Alternative 7D
4. Annual Navigation Impacts				
a. Non-Federal	\$0	\$0	\$0	\$0
b. Federal	\$121,000	\$127,000	\$132,000	\$136,000
c. Total	\$121,000	\$127,000	\$132,000	\$136,000
5. Other Annual Costs				
a. Non-Federal	\$0	\$0	\$0	\$0
b. Federal	\$12,000	\$12,000	\$12,000	\$12,000
c. Total	\$12,000	\$12,000	\$12,000	\$12,000
6. Total Annual Costs				
a. Non-Federal	\$12,319,000	\$12,668,000	\$12,993,000	\$13,317,000
b. Federal	\$16,193,000	\$16,588,000	\$16,981,000	\$17,372,000
c. Total	\$28,512,000	\$29,256,000	\$29,974,000	\$30,689,000

OTHER SIGNIFICANT EFFECTS ACCOUNT

As shown under the OSE account in System of Accounts, noise would increase temporarily during construction for any of the alternatives investigated. There would be no significant impact on community cohesion, aesthetics, or displacement of people. However, there would be a significant increase in recreational opportunities from the additional waterfowl habitat provided for hunting by all alternatives.

PLAN SELECTION

RATIONALE FOR SELECTION

Selection of the “best” plan of improvement for the Grand Prairie involved the screening of the alternative plans relative to the formulation and evaluation criteria as previously outlined. Considering the results of impact assessment and evaluation of alternatives, economic benefits and costs, and views and desires of the potential project sponsor; Alternative 7B was identified as the “best” plan for meeting the current and future water and related land resources needs of the area. Alternative 7B maximizes net economic benefits over costs and is the economic optimum or NED plan. It provides in excess of 36 million dollars in annual benefits at an annual cost of slightly over \$29 million. Its excess benefits over costs are \$6.9 million with a benefit-to-cost ratio of 1.2 to 1. The planning objectives are met and constraints are avoided to the maximum extent feasible. Alternative 7B allows for preservation of the area’s aquifer by providing an adequate and dependable supplemental source of irrigation water for users in the area by providing 88% of an average year’s unmet need. This enables the project to meet the objective of protecting and preserving the alluvial aquifer by minimizing groundwater depletion, thereby allowing the region to maintain its output of agricultural products and its economy. The selected plan maximizes the area’s conservation efficiency and provides a source of supplemental irrigation water with additional on-farm storage to meet peak demands. It also satisfies the objective of increasing fisheries and waterfowl habitat through the construction of new canals and reservoirs and by providing a dependable source of water for wintertime flooding. It also provides an opportunity for prairie restoration by establishing prairie grasses within the project’s rights-of-ways.

RISK ANALYSIS

Risk analysis provides an estimate of the uncertainty inherent in the economic data used to evaluate the effects of the project. It addresses the areas where risk and uncertainty are known to exist so that the economic performance of the project can be expressed in terms of probability distributions. Risk analysis was performed using Excel spreadsheets in conjunction with an add-on simulation model entitled @Risk. It incorporated the range (maximum and minimum) of possible values for input variables and specified the statistical distribution of likely outcomes over the chosen range. In the case where a normal distribution was assumed, 68% percent of the occurrences of a

particular outcome would fall within (plus or minus) one standard deviation, on either side of the mean, and 95% percent within two standard deviations on either side of the mean. Some sources of risk and uncertainty arise from measurement errors, small sample sizes, estimation and forecasting errors, and modeling errors. The variables affecting the benefits, the shape of their distributions, and the amounts they are allowed to vary during the simulation are presented in Table 8 in order of significance. The most significant variable was the 25% variation in crop yield followed by the 15% variation in crop prices. The 2 standard deviations in the input projection factor, 10% variation in crop mix, and variation in interest rate had negligible effect on the analysis.

Table 8.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Description of Variables Used in Risk Analysis

Item	Variation in Item	Distribution	Rank
Crop Yields	25 Percent	Truncated Normal	1
Crop Prices	15 Percent	Truncated Normal	2
Output Projection Factors	2 Standard Deviations	Truncated Normal	3
Crop Production Cost	5 Percent	Truncated Normal	4
Crop Distribution	10 Percent	Truncated Normal	5
Input Projection Factor	2 Standard Deviations	Truncated Normal	6
Interest Rate	One-Half Percentage Point	Truncated Normal	7

RELIABILITY ANALYSIS

Reliability analysis provides information on how dependable the project will be in providing adequate water to irrigate the project area. The two factors influencing the reliability of the project are: (1) The demand for irrigation water and (2) The amount of water that the project can provide. The mean or average demand before conservation to irrigate the entire 241,777 acre project area is 481,195 acre-feet with a standard deviation of 77,730 acre-feet. After conservation the demand is effectively reduced by 68,742 acre-feet to 412,453 with a standard deviation of 66,626. The demand varied greatly over the 47 year period of record. After the conservation practices were implemented, it varied from a low of 303,839 acre-feet to a high of 604,143 acre-feet. The wide range between the two extremes is due to the unpredictability of rainfall and wide variation in temperatures from year to year. Lower rainfall and higher temperature levels increase the need for supplemental irrigation water. Higher rainfall and lower temperature levels decrease the need for supplemental irrigation water. The project is also limited by the amount of water that can be imported from the White River. This amount varies from year to year depending on the precipitation falling upstream of the pumping station. The mean demand met by Alternative 7B is 421,404 acre-feet (includes 68,742 acre-feet of

conservation) with a standard deviation of 101,861 acre-feet which translates into a mean irrigated acreage of 209,046 acres and a standard deviation of 50,530 acres. This means that on an average year approximately 87.6% of the average demand can be met (421,404 acre-feet/481,195 acre-feet).

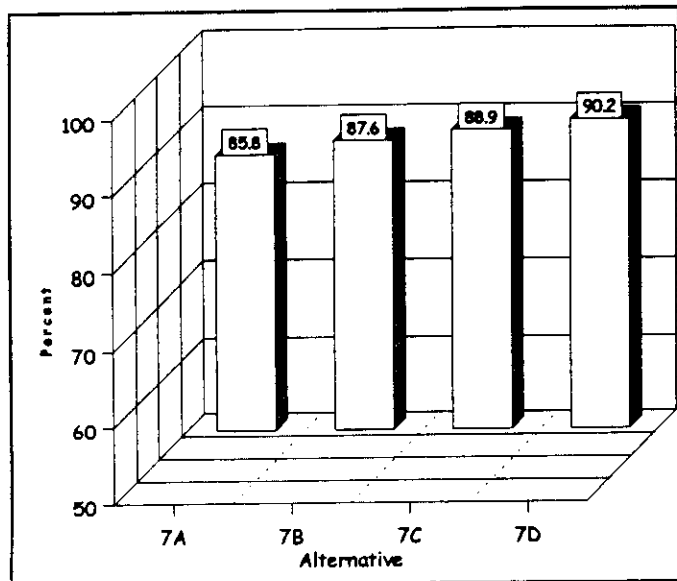


Figure 7
Percent of Mean Year's Irrigate Crop Acreage Provided by Alternatives 7A-D

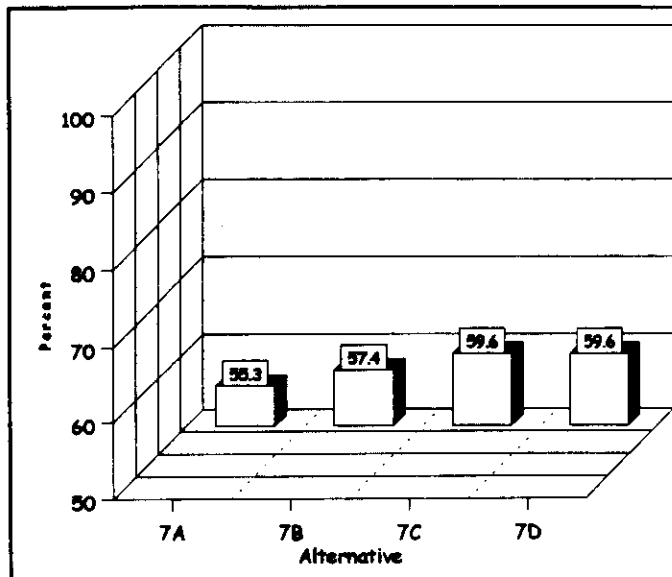


Figure 6
Percent of Time All Cropland is Irrigated by Alternatives 7A-D

Another way of looking at the reliability of the project in meeting irrigation demands is to see how often all of the area could be irrigated. Alternative 7B could provide sufficient water to irrigate the entire 241,777 acre area 57.4% of the time or 27 years out of the 47 year period of record. This does not mean that for the remaining 42.6% of the time no irrigation would occur. Irrigation would always take place, just at lesser than maximum levels. Figures 6 and 7 graphically present the percent of an average year's irrigated acreage and the percent of time all of the area is irrigated based on the 47 year period of record for alternatives 7A-D.

DESCRIPTION OF SELECTED PLAN

The selected plan is the combination of measures which best meets the identified needs and opportunities of the project area consistent with the planning objectives and constraints and addresses the concerns expressed by various interest groups during the course of the general reevaluation. Components of the plan are described in the following sections and presented graphically in Volume

8, Appendix B, Section VII - References Maps. A more detailed description of specific project features and designs are contained in Volumes 2 through 10 of the report.

PLAN COMPONENTS

The demonstration project consists of four major components for supplying supplemental irrigation water to the project area and preserving existing water resources. The identified irrigation water supply components are (1) conservation - increased irrigation efficiencies, (2) groundwater, (3) additional on-farm storage reservoirs, and (4) an import water system. Environmental features are also an integral part of the selected plan. The components of the selected plan are discussed in the following paragraphs.

CONSERVATION - INCREASED IRRIGATION EFFICIENCIES

The first component of the selected plan is implementation of conservation measures. Conservation measures are improvements in the on-farm water distribution system and/or changes in farm management practices such as irrigation application methods and soil moisture monitoring that result in increased irrigation efficiencies. Irrigation or system efficiency is defined as the percentage of water ultimately utilized by the plants as compared to the amount obtained at the source. It is a measurement of not only the effectiveness of the irrigation delivery system itself, but also of farm management practices employed. Conservation measures outlined within this report and recommended for implementation on a project wide basis are presently employed to various extents within the region. Based on historical data analyzed by the NRCS the average irrigation efficiency of existing farming operations within the project area is 60 percent. Though this level of efficiency indicates that no economic benefits are derived from 40 percent of the water, the 60 percent level is considered to be well within regional and national averages for similar operations.

Significant factors contributing to the 40 percent inefficiencies within the system are application of water in excess of plant needs, evaporation and seepage losses from open distribution systems and the lack of tailwater recovery systems. Within the scope of the selected plan the NRCS will develop a comprehensive "Water Management Plan" for each farm serviced. At present the NRCS has selected approximately 15 % of the farms within the project area and developed specific management plans for projecting costs and determining the maximum achievable efficiency level. These analyses along with extensive field tests show that the average efficiency can be increased to 70%. This 10 % increase in efficiency is equivalent to a 14.3 % (68,742) reduction in the annual water demand for the project area. Key features of the farm management plans are closed distribution systems (underground pipelines), tailwater recovery systems and monitoring of soil moisture. Approximately 630 miles of new underground pipeline with appurtenances will be installed to replace open canals and inadequate on-farm distribution systems. Utilization of pipelines will allow for better management and control of water at the farm level and will minimize losses from evaporation and seepage.

Tailwater recovery systems will be an integral part of the water management plan developed for each farm. These systems are in essence a method of "recycling water". Tailwater is a term applied to the free standing water within the fields that is drained by gravity into a system of collection ditches. These ditches in turn lead to pumps where the water is placed back into on-farm storage reservoirs. Alternatively, the water may be directly routed to another area for field application. With the selected plan it is estimated that an additional 675 miles of tailwater recovery ditches will be required to collect, transport and store rainfall runoff and tailwater. This system of shallow collection ditches is also an integral aspect of the on-farm storage system discussed in subsequent paragraphs. Associated with the collection system are roughly 560 water control structures necessary to control runoff rates and to provide pools for pumping back into reservoirs or for field applications. In addition to these structures approximately 700 pumps or relifts will be required to move water through the tailwater recovery systems. Only estimated quantities for the water control structures and pumps can be provided prior to completion of all Water Management Plans. Additional information regarding the design of the tailwater recovery systems can be found in Volume 2, Appendix A, NRCS On-Farm Report.

GROUNDWATER

Underlying the Grand Prairie is the alluvial aquifer that historically served as an abundant source of relatively cheap water. The aquifer is composed of predominantly medium to fine-grained clean sands within the upper zone and grades to a gravelly sand with depth. Though aquifer thickness is variable, well logs indicate that it generally ranges from 25 to 140 feet. The alluvial aquifer is overlain with a silt and clay unit with thicknesses in the range of 10 to 50 feet. This top unit is nearly impervious and is the reason that this area is conducive to rice production. Contained within the older strata underlying the alluvial aquifer is a water bearing stratum known as the Sparta sand. In recent years there has been development of this deeper aquifer, particularly in those areas where the shallow aquifer has experienced its greatest declines. Placement of these "deep" wells has been considered as a last resort due to the depths of the wells (excess of 800 feet) and the high energy costs required to recover the water. As a note the hydraulic conductivity, which can be thought of as a measurement of the aquifers capability to recharge itself, of this deeper aquifer is much less than the "shallow" or alluvial aquifer. The deep wells that have been installed to date are already creating significant declines on the water levels within the aquifer. In fact U.S.G.S. estimates that at current pumping rates for the deep or Sparta aquifer there will be an 80 foot decline in the water level by the year 2002. Obviously this deep aquifer which serves as the municipal water supply within this region, can not be viewed as a solution to the declining ground water levels within the alluvial aquifer.

As important as the alluvial aquifer is to the economy of the Grand Prairie it unfortunately has been mined for agricultural practices at a rate that far exceeds its capacity to replenish itself. Prior to development of the aquifer for rice production at the turn of the century, flows within the aquifer served as a source to adjacent rivers such as the White and Arkansas. However, as irrigated acreage increased the demands placed on the aquifer also increased. Eventually, the demands placed upon the aquifer became such that it no longer served as a source to the rivers. Instead of being a source the alluvial aquifer is now recharged by these rivers. Though the alluvial aquifer is being recharged

by the adjacent rivers it is being done so at a rate much lower than withdrawals are occurring. Current estimates are that recharge into the alluvial aquifer is at a rate of between 100,000 and 130,000 acre-feet per year for the Grand Prairie project area. This recharge rate is not constant with time since it is directly related to the declines within the alluvial aquifer itself. As long as the average annual withdrawals continue at a rate in excess of 400,000 acre-feet per year there will be a continual decline in the aquifer water table. This decline will continue until the saturated thickness of the aquifer reaches the point that it can no longer support well development.

Implementation of the selected plan will sustain the alluvial aquifer by establishing a "safe yield" for the aquifer. By definition "safe yield" is a yield that will not result in any additional decline of water levels within the aquifer. Groundwater modeling conducted by Dr. Peralta at the University of Arkansas estimated that the portion of the aquifer underlain by the Grand Prairie could sustain a "safe yield" of approximately 35,000 to 40,000 acre-feet annually. The water balance model for the selected plan calls for the alluvial aquifer to provide approximately 8% of the projected future needs. This equates to approximately 36,000 acre-feet of water. Details of the water balance model for the project are presented in Volume 3, Appendix B, Section I, Hydraulics & Hydrology.

ON-FARM STORAGE

The on-farm storage system consists of above or below ground earthen reservoirs and tailwater recovery ditches used to capture and store runoff for irrigation. Sources of water in order of preference for use in filling the on farm storage systems are rainfall runoff, tailwater recovery and groundwater with the preference being established by economic factors. On-farm storage provides a reliable source for the large volumes of water that are required for the initial flooding of the rice fields and irrigation of other crops at critical times during the growing season. Presently there are 15,556 acres dedicated to storage in the project area. Individual reservoirs vary in areal extent from 25 acres to in excess of 500 acres with the 40 to 60 acre size being the more prevalent. Existing reservoirs have a storage capacity of approximately 84,525 acre-feet of water; however, it is estimated that only about 73,188 acre-feet is recoverable or available for use. With the selected plan an additional 8,849 acres of cropland will be converted to on-farm storage reservoirs. These new reservoirs will provide 88,493 acre-feet of storage capacity. The new reservoirs are assumed to be located on lands identified for soybean production and are equally distributed throughout the project area. Reservoir sites will be identified in the water management plans developed by the NRCS. Additionally, the reservoirs will be located at the higher elevations within a farm so as to maximize gravity flow and avoid impacts to wetlands. These new reservoirs when combined with existing storage will provide approximately 31 percent of the with-project decreased needs for an average year. The reduction in with-project needs are due to implementation of the previously described conservation measures. Though assumptions were made in developing the selected plan as to the operation of the reservoirs, the reservoirs will remain in private ownership and the daily management of such will be at the owner's discretion. Assumptions made regarding the operation of the reservoirs, such as the filling schedule, were made to minimize the risk of having an inadequate supply of irrigation water at critical times during the growing season.

Additional on-farm storage was only considered in conjunction with the implementation of conservation measures. Storage reservoirs were not considered without conservation measures since it was demonstrated that conservation measures provide the greatest return on the investment. Additionally, the construction of new reservoirs can not meet the total water needs without an additional source of water. Even with the proposed conservation measures there is not an adequate supply of rainfall runoff, tailwater recovery or groundwater to economically justify the construction of all of the new on-farm storage. Existing water sources and implementation of conservation measures can only support the construction of approximately 1379 acres of new reservoirs. With this maximum level of reservoirs, implementation of conservation measures, and withdrawals of groundwater at a safe yield only 31 percent of the existing cropland can remain in irrigation. The remaining area would be required to convert to less profitable dryland farming.

IMPORT WATER

The import system consists of all features necessary to import water from the White River northeast of DeVall's Bluff and deliver it to each tract of land within the project area. Major features comprising the system are a 1640 cfs pumping station, 100 cfs relift station, earthen distribution canals, gated hydraulic control structures, reinforced concrete pipeline, PVC pipeline, canal turnouts, pumps, existing streams, and rock weirs within existing streams. The proposed import system will also require an extensive monitoring and control system for directing flows within the system and to prevent the diversion of excessive amounts into natural streams. Numerous structures referred to as siphons will also be utilized to maintain existing drainage patterns that are impacted by construction of the distribution system.

MAJOR PUMPING STATION

The predominant feature of the import system is a 1640 cfs station that is will located within the floodplain of the White River northeast of the City of DeVall's Bluff. The footprint of the pumping station structure is approximately 14,000 square feet and the structure will rise in height to roughly 60 feet above the floodplain of the White River. As 20 feet of fill will be placed atop the floodplain adjacent to the station for access and stability purposes only 40 feet of the 60 feet will be exposed. The base of the structure will be at elevation 140 which is 30 feet more or less below the floodplain of the White River. The station will be situated near the base of the bluffs adjoining the western limits of the White River flood plain so as not to impede flood flows within the flood plain itself. Situated atop the bluffs forming the western limits of the flood plain is the region referred to as the Grand Prairie. Plate 4 is a location map of the pumping station site including the inlet channel and discharge pipes.

Access to the site will be along a new road off of Arkansas Highway 70. The Arkansas Highway Department has scheduled the realignment of Highway 70 in the vicinity of the pumping station along with the construction of a new bridge over the White River. The highway department provided centerline alignment drawings for use in establishing an access route to the pumping station. The new route for Highway 70 will still be south of the proposed pumping station but north of the

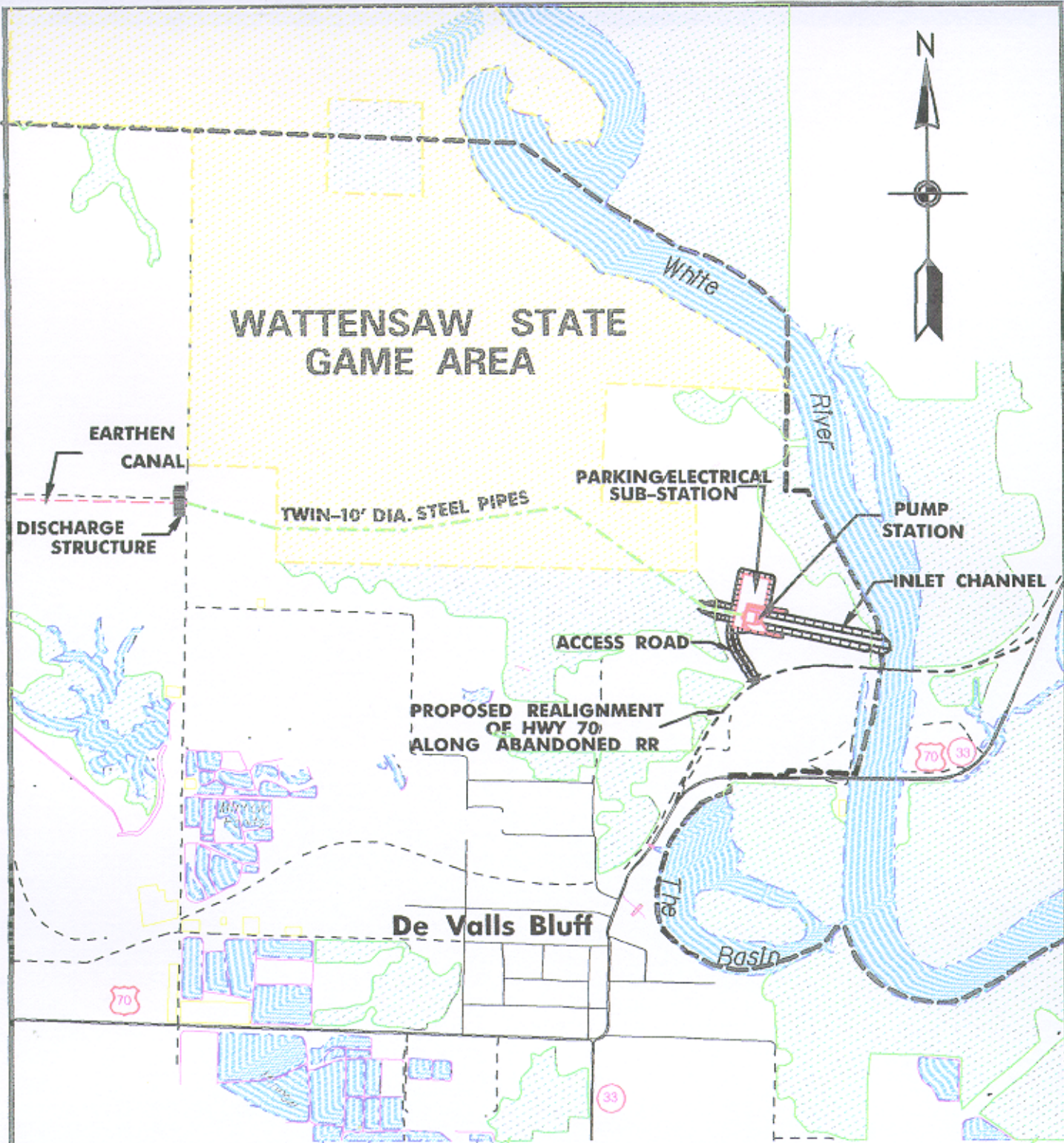
existing highway. The alignment of the new highway was also taken into consideration when determining the alignment of the inlet channel to the pumping station. The access road, parking areas adjacent to the facility and a site for an electrical substation will be constructed using select fill material obtained from excavations at the site. Located immediately north of the pumping station and adjoining the state game area is a land tract that will have its access affected by construction of the station. In lieu of providing an access road to this site it is anticipated that this land will be purchased as part of project mitigation.

The pumping station will house six vertical mixed-flow pumps with four being rated at 360 cfs each and the remaining two rated at 100 cfs each. The four 360 cfs pumps will be driven by 5300 HP electric motors and the two 100 cfs pumps will be driven by 1650 HP electric motors. By specifying two size pumps greater flexibility will be provided in meeting the variable water demands that will be placed on the system. All six pumps will have a formed suction inlet with roller gates installed at the entrance of each pump inlet conduit. Motor hoists will be used to open each of the roller gates when needed. The inlet slab for the conduits is set at Elevation 144.0. For reference purposes the historical low water elevation for this reach of the White River is Elevation 153.3.

The pumping station will have office facilities to accommodate the daily operation of the distribution system. All system components will be monitored and controlled from this facility. All data from the remote sites will be electronically transmitted back to this facility as part of the Supervisory Control and Data Acquisition (SCADA) system. This will allow for real time monitoring of the system so that pumping adjustments to the system may be made as the situation dictates.

Water from the White River will be conveyed to the pumping station inlets by an earthen channel. The inlet channel will be approximately 2000 feet long with a 104 foot bottom width and 1V on 3.5H side slopes. The bottom grade of the inlet channel will be at Elevation 137 at its confluence with the White River and Elevation 144.0 at the inlet slab of the pumping station. The confluence of the inlet channel and river coincides with the reach of river that hydrographic surveys indicate have the maximum depth of water. The inlet channel is sized to maintain minimum velocities during maximum pumping in conjunction with minimum river stages. Limiting velocities will not only provide a stable inlet channel, but will also minimize impacts to juvenile larvae fish. Even though velocities within the inlet channel are generally less than one foot per second, rock will be placed in the vicinity of the inlet slab and the confluence with the White River as a precautionary measure.

Discharge of the import water from the pumping station will be through 1.7 miles of twin - 10 foot diameter, 1/2" thick steel pipes. The discharge pipes will exit below ground from the west end of the pumping station and remain buried beneath the flood plain. At the juncture of the flood plain with the toe of the bluff slope the discharge pipes will be near ground level. The discharge pipes will then proceed up the outer slopes of the bluff to a ridge line atop the bluffs within the Wattensaw State Game Area. Within the game area the twin pipelines will generally follow the ridge line in order to minimize construction costs and environmental impacts. The steel pipes will discharge through an outlet structure into an earthen canal west of the Wattensaw State Game Area. The maximum design discharge elevation is 233.3 with natural ground elevations at the discharge structure being



LEGEND

- DEMONSTRATION PROJECT BOUNDARY
- - - NEW CANAL



US Army Corps
of Engineers
Memphis District

EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY
GRAND PRAIRIE AREA DEMONSTRATION PROJECT

VICINITY MAP
MAJOR PUMPING STATION

Scale : 1" = 2000'

PLATE 4

on the order of elevation 222. Therefore, at the point of discharge into the earthen canals the hydraulic grade line will be approximately 11 feet above natural ground and 80 feet above historical low water levels within the White River.

RELIFT STATION

Topography dictates that a 100 cfs relift station be constructed to service the project areas northwest of the city of Hazen. This station will be built along Canal 3200 north of Highway 70. The station's footprint is roughly 700 square feet and will house five electrical motors and pumps rated at 20 cfs each. Intakes for the pumps consist of five 36" diameter reinforced concrete pipes. The intakes are approximately nine feet below natural ground and the elevation of the outlet canal is two feet above ground. The station will be fully automated and controlled from the major pumping station. Capability will be provided to manually override the automatic control system at the relift station in the event a malfunction of the control system or operator error should occur. Office spaces and other amenities will not be incorporated into this structure.

CANALS

The primary mechanism for conveying the imported water is 184 miles of earthen canals. The canal system originates at the termination of the steel discharge pipes northwest of the city of DeValls Bluff and generally flows in a westward direction along the northern reaches of the project area. Once the major canal nears the western boundary of the project area the predominant flow directions become south and east. Numerous secondary canals are used for servicing the adjoining land tracts and to provide water to the existing streams. Among the factors considered in determining the canal locations are topography, tract boundaries, degree of urbanization, environment and proximity to existing streams. Canals are generally located along the higher ground so as to take maximum advantage of gravity flow and thus reduce the number of secondary pumps required. The canals were also located so as to avoid as much of the urbanized areas as economically feasible and to minimize impacts on environmentally sensitive areas. Tract boundaries were utilized in the canal layout process to insure that all areas were serviced and to prevent creation of land remnants that can not be farmed economically. Additionally, canal alignments were selected that maximized the use of natural streams for conveyance.

The distribution canals range in bottom width from 5 feet to 60 feet with canal embankment heights a maximum of 20 feet above natural ground. Though the canal embankments forming the distribution system are primarily above natural ground, there are reaches where the canals are at or below natural ground levels. The crown width of the canals are 10 feet on both sides and all canals have a 1V on 3.0 H inner slopes. The outer slope is also 1V on 3.0 H for heights less than 10 feet but is flattened to 1V on 3.5H for slopes greater than 10 feet. This geometric section for the canals was determined based on stability, anticipated construction techniques, and maintenance considerations. It is planned to establish native prairie grasses along the canals upon completion of the construction process. For access, inspection and maintenance purposes a 10 foot easement will

be obtained along the outer toe of the canals. A typical section is presented in Volume 5, Appendix B, Section III, General Engineering.

Material used in constructing the above ground portions of the canals will be obtained by excavating within the limits of the canals. In the event there is not sufficient material within a reach to construct the above ground portion, the canal will be over excavated to provide the necessary material or additional material will be transported in from adjoining reaches. Where canal excavation results in an excess of excavated material the material will be used to widen the canal crown widths, raise the embankment heights, and/or flatten the outer slopes. Excavation for the canals will require the removal of the nearly impervious "hardpan" that is conducive to rice production. Removal of this layer will expose the more permeable layers underlying the hardpan and result in infiltration losses to the alluvial aquifer. These losses were computed and accounted for in the water balance model of the system.

EXISTING STREAMS

Existing streams within the project area were incorporated into the distribution system to the extent possible. Major streams used as part of the distribution system include LaGrue Bayou, Little LaGrue Bayou, Lost Island Bayou, Wolf Island Slash, Oak Creek, Mill Bayou, Elm Prong Mill Bayou and Stuttgart King Bayou. A total 291 miles of existing streams will be used to deliver water to the tract level. Typically water will be placed into the streams at several points along their route. The use of multiple service points for the existing streams is necessary to avoid exceeding the streams in-bank capacity and inducing flooding as well as to bypass existing dams that have been placed in the streams by riparian landowners. Release of irrigation water into the streams will be fully automated. This will allow for immediate termination of releases, especially in the case of large rainfall events. In order to recover the irrigation water placed into the streams it will be necessary to construct a system of low water rock weirs within the streams. These weirs will serve to create an upstream pool of sufficient depth to allow for irrigation withdrawals. These weirs will maintain pools in streams that normally become dry and desiccated during the summer months. The distribution system will require approximately 120 weirs be placed in existing streams. The proposed locations of these weirs are presented in Volume 8, Appendix B, Section VII, Reference Maps. No channel enlargements or cleanouts of the existing streams are proposed as part of the selected plan.

PIPELINES & PUMPS

The distribution system also utilizes pipelines for conveyance. A total of 177 miles of pipeline are estimated as part of the system. These pipelines are composed of both PVC pipe and reinforced concrete pipe (RCP). Pipelines less than 18" diameter are generally specified as PVC whereas RCP is specified for the larger size pipes. The pipelines are primarily utilized where flow within the system has dropped to a level that makes their use more economical than canals. However, there are reaches where the use of larger size concrete pipes are necessary due to topography and/or other constraints. All of the pipelines will be buried so as to not interfere with farming operations or obstruct traffic.

Also, it will be necessary to install 197 pumps in conjunction with the pipelines. These pumps are predominantly in the 5 to 10 horsepower but do range up to in excess of 200 horsepower.

STRUCTURES

A wide range of structures is required to make the distribution system operational. Structure types include bridges and culverts, check structures, turnouts, siphons, pumps and wasteways. Features such as check structures, turnouts, wasteways and pumps are used to physically control the distribution of flows within the canal system and regulate the flows to the existing streams. The remaining structure types are used to maintain pre-project conditions. An overview of the function and quantity of the various type structures required are presented in the subsequent paragraphs. The geographical location of the proposed structures are presented in Volume 8, Appendix B, Section VII, Reference Maps. Technical aspects relating to the structures such as design criteria, computations and drawings are presented within Volume 5, Appendix B, Section IV, Structural, Electrical & Mechanical.

BRIDGES & CULVERTS

The bridges and culverts serve to maintain access across the distribution canals at road and railroad crossings. Thirty-four bridge sites and 156 culvert sites have been identified. At bridge sites the roadway approaches are either above the canal embankment or the approaches will be elevated to the top elevation of the embankment in order that a bridge can be constructed to span the canal. All design and construction for the bridges will be in accordance with the applicable Arkansas State Highway Standards. No changes in the roadway approach elevations are required for the culvert crossings. At these sites the canals will be carried beneath the roadway by the use of either box or pipe culverts. The size of these culverts range from 36" reinforced concrete pipe to 7- 10' x 10' concrete boxes. Details and drawings for these two types of road crossings are presented in Volume 5, Appendix B, Section IV, Structural, Electrical & Mechanical.

SIPHONS

Structurally similar to the culvert road crossings but different in function are siphons. Siphons are used to address the conveyance of flows within the natural streams and ditches. System design constraints dictate that rainfall runoff not be introduced into the distribution canals. Instead siphons are used to reestablish drainage patterns impacted by construction of the canals. Typically, the natural drainage patterns will be maintained by conveying the flows of existing streams and ditches beneath the distribution canals. However, there are certain cases where it will be more economical to pass the canals beneath the natural streams. A total of 103 sites will require siphons. The siphons will be constructed of reinforced concrete pipe having diameters between 48" and 96".

CHECK STRUCTURES

Check structures are gated type structures placed in-line for control purposes. They are used to regulate the water surface elevation in the canal pool upstream and to release flow to the downstream canal pool. Four of the larger type check structures will be required along the main canal distribution system. These structures are similar in appearance and design to conventional gated flood control structures. However, unlike conventional flood control structures these structures can be subjected to reverse hydrostatic loading conditions. They consist of a vertical section housing remotely operated sluice gates and a downstream stilling basin. Incorporated into the structural design are overflow sections to allow passage of flows in the event of gate malfunctions or operator error. Along the secondary canals gated conduit check structures are installed horizontally under in-canal earth dams separating the upstream and downstream canal pools. The vertical lift gates for the conduits are housed in a riser section located near the crest of the earthen dam separating the upstream and downstream pools. Fourteen of these structures are required with the size of the conduits varying from twin 1.5' diameter pipes to twin 5' diameter pipes.

TURNOUTS

Turnouts are similar in design to the gated conduit check structures but differ in purpose and location. Turnouts are utilized to divert water from one segment of the delivery system to another for furnishing water to another area. Whereas control structures are located in-stream of the canals, the turnouts are generally located through the sides of the canal embankments. Five different types of turnouts are identified within the selected plan. They are summarized as follows:

- ❖ Type 1 - Diversion by gravity flow from the primary canal to the receiving end of a secondary canal.
- ❖ Type 2 - Diversion by gravity flow from the primary canal to a buried pipeline.
- ❖ Type 3 - Diversion by pumping through a pipeline.
- ❖ Type 4 - Diversion by gravity from the end of a canal normally to an existing stream.
- ❖ Type 5 - Diversion from pipeline back into an open channel.

A total of 144 turnouts are identified as part of the selected plan. Of the 144 turnouts 64 of them will require pumps. These pumps vary in size from 5 horsepower to 95 horsepower.

WASTEWAYS

Wasteways are similar in function but larger in size than the lateral turnouts used to divert water into receiving streams. Seven wasteway structures have been identified as part of the selected plan. Their function is to allow for the rapid discharge of water from within the system. In the event of a gate failure or operator error water within the system can be diverted through the wasteways and into the larger existing streams. This capability will provide a safeguard against overtopping and breaching of the canal embankments. The wasteways can also be utilized as a means of dewatering the system in order to perform periodical maintenance on the structures or canals.

RETROFIT

The on-farm portion of the project will include the retrofit of existing on-farm irrigation systems to the new import distribution system. Retrofitting will include the installation of new canals, pipelines, and lift stations to efficiently move the water from the on-farm source point to the storage and application areas on the farm. The needs of each individual farm will be indentified in the water management plan.

LANDS

Project construction will require approximately 8,065 acres of land. An estimated 925 individual ownerships will be impacted by project construction. Project lands are primarily located in rural agricultural areas and are primarily used for agricultural production or woodland purposes. The project has been planned and designed to avoid or minimize relocations. Rights-of-way for the project will be acquired through the use of six estates. The estates are: Fee Simple, Restricted Channel Improvement Easement, Water Pipeline Easement, Road Easement, and Restricted Access Road Easement. A Temporary Construction Easement will be required during construction of the discharge pipes from the pumping station. A fee estate will be used for acquisition of the major pumping station site, 100 cfs lift station site, mitigation lands, and the locations of the check structures. Approximately 436 acres of agricultural cropland will be acquired for mitigation purposes.

A detailed description of the real estate requirements and costs are provided in Volume 10, Appendix E, Real Estate. Appendix E provides a detailed description of the real estate component by individual construction item. A summary of the real estate costs contained in the gross appraisal report is presented on Page 21 of Appendix E. Volume 9, Appendix C, Section II, Mitigation and Environmental Features, provides a discussion on project mitigation requirements.

RELOCATIONS

Bridges will be required at thirty-four crossings to adequately pass the design flows. Bridge designs are based on Arkansas State Highway Standards and meet HS-20 live loadings. The total relocations cost for bridges is \$7,541,400.

Utilities at 342 locations will be impacted by the project. These utilities include electric lines (141), telephone (84), water (75), gas service (23), fiber optic cables (17), and railroad telegraph lines (2). The extent of utility alterations necessary to accommodate the project is predicated on providing horizontal and vertical clearance for project construction, operation and maintenance. Utility alterations are necessary where a canal or pipeline crosses a utility. The facility inventory and cost estimates for utility alterations are provided by construction item in Table III-B-1 in Volume 5, Appendix B, Section III, General Engineering and Relocations.

ENVIRONMENTAL FEATURES

The environmental benefits or features of the project are either a result of project design, specific restoration, or mitigation. Environmental project features will restore native prairie vegetation, stream fishery, and provide waterfowl habitat to the project area. Volume 9, Appendix C, Section II, Mitigation and Environmental Features provides a detailed discussion on the mitigation and environmental features of the selected plan.

WATERFOWL

Under the auspices of the North American Waterfowl Management Plan, harvested rice fields would be flooded annually from 1 November to 28 February to benefit waterfowl. The selected plan would flood 38,529 acres of harvested rice fields on an average annual basis; this would provide 22,385,349 duck-use-days (DUDs) annually. A DUD is defined as the capacity of available forage to meet the energy needs of one duck for one day. In comparison to future without-project conditions, this represents an annual increase of 21,129 acres of cropland flooded and 12,275,949 DUDs.

FISHERIES

Approximately 120 weirs will be constructed in existing streams at locations throughout the project area. The purpose of these weirs is to provide a minimum pool in the streams for irrigation withdrawals. Streams within the project area generally experience extremely low flows or in most cases no flow at all during the summer months. Studies conducted by the U. S. Army Corps of Engineers, Waterways Experiment Station concluded that these pooled areas and the increased velocities over the weirs will significantly improve fishery habitat. The import water from the White River during the spring and summer months will especially improve habitat quality. Habitat Unit Values (HUVs) for receiving streams will increase as much as 4,328 HUVs per month. This feature provides significant stream restoration.

PRAIRIE RESTORATION

A proposed environmental project feature of the selected plan is a plan to restore native prairie within the project area. The unique opportunity to establish native prairie vegetation within the rights-of-way of the proposed irrigation canals exists. Approximately 184 miles of new canal are included in the distribution system. These canal levees and berms provide the opportunity to significantly increase the amount of tallgrass prairie within the project area and vegetatively connect existing prairie remnants. The existing 500 acres of prairie scattered throughout the Grand Prairie region would be increased by some 3,000 acres. These established corridors of native grasses would provide passageways for movement for many grassland wildlife species.

MITIGATION REQUIREMENTS

A mitigation feature is best described as an “on-site” established fish and wildlife resources management procedure, activity, or technique that is designed to offset construction and/or associated impacts. Numerous mitigation features that will partially offset terrestrial and aquatic losses have been incorporated into the project design.

A wide range of alternatives were considered for mitigating the unavoidable wildlife habitat losses associated with project construction. Mitigation needs for the project were determined based on project impacts assessed from a Habitat Evaluation System (HES) Analysis. Approximately 243 acres will be required to mitigate wetland losses. This acreage will be either prior converted or farmed wetland. Identification of the lands in these categories within the project area will be accomplished by the NRCS. Soils delineation to accomplish this activity has been completed for the project area. Approximately 193 acres of cleared upland property will be required to replace upland hardwood losses.

DESIGN AND CONSTRUCTION CONSIDERATIONS

HYDROLOGIC CONSIDERATIONS

Hydrologic studies were conducted to determine how irrigation flows and the new canals used to convey these flows might affect the natural drainage within the project area. It was also necessary to determine if selected existing streams could be incorporated into the delivery system. A hydrologic study of the project area provided estimates of the magnitude and frequency of natural flows occurring in the existing streams. This information was utilized in the design of the hydraulic structures. The hydrologic study results allowed the siphon and weirs to be designed to function with inducing flooding.

HYDRAULIC DESIGN

A complex system of hydraulic structures are necessary to convey water in a controlled manner through the delivery system. The types, dimensions, and locations of the structures required for the delivery system were determined based on the desired operation of the system. Volume 4, Appendix B, Section I, Part C, Hydraulics, presents a detailed description of the hydraulic analysis and design of all hydraulic structures.

FOUNDATIONS & GEOLOGY

This project spans two distinct geological settings. The first is the alluvial floodplain along the White River on which the major pumping station and its related structures are to be constructed. At this site the floodplain is composed of loosely consolidated “point bar” deposits associated with the prehistoric Mississippi-Ohio River Complex. These types of deposits are predominantly sands and silty

sands with occasional layers or “swales” of high plasticity clays. This generalized geology has been confirmed by the subsurface investigations performed. It is not anticipated that any unusual or unique construction techniques will be required for the pumping station or its related structures.

The second distinct geological setting identified is the terrace deposits which blanket the area known as the Grand Prairie. These are deposits on which the import system and all other features of the selected plan, with the exception of the major pumping station and its inlet channel, will be constructed. These surface deposits are composed of very dense and relatively impervious layers of clays and silts. The near impervious nature of these deposits is what makes this region conducive to rice production. Underlying the surface deposits of clays and silts are more pervious sands and silty sands. Within selected reaches construction of the earthen canals will require removal of the top stratum of clays and silts. This removal will increase infiltration losses into the underlying sands and silty sands. Detailed investigations and analyses were performed to predict these losses. These estimates of losses were used in developing the water balance model for the selected plan. As with the deposits forming the floodplain, no unique construction techniques are anticipated for project features located on the terrace deposits forming the Grand Prairie.

RELOCATIONS

A facility inventory and layout of all facilities affected by project construction was prepared. Canals were routed to avoid residences and other major structures. An Attorney’s Opinion of Compensability will be done prior to execution of the PCA. Canal alignments were modified throughout the planning and design process to minimize facility relocations to the extent feasible.

CANALS AND LEVEES

Canal design considerations used in the development of the delivery system for the Grand Prairie project were as follows:

- ❖ Provide service to all irrigated tracts within the project area.
- ❖ Maximize gravity flow distribution.
- ❖ Determine stable canal proportions required to convey the design discharge.
- ❖ Obtain balanced earthwork quantities.

In determining canal alignments, preliminary alignments were established in the early phases of the project design considering the following:

- ❖ Location of irrigation tracts
- ❖ Topography
- ❖ Location of roads, utilities, building, and other improvements
- ❖ Environmental considerations
- ❖ Existing natural and man made streams and ditches
- ❖ Tract boundaries, minimize division of properties

Generally the canals were located along ridges where possible in order to permit withdrawals by gravity flow. Also, certain alignments were selected to reduce the number of conveyance structures required to convey the canals over or under existing utilities, roads or natural streams or to avoid environmental areas or existing structures.

During the detailed engineering and design phase field verification of the preliminary alignments were made and reviewed in light of comments provided by local interests throughout the project area. As a result of this review some changes in the alignments were made but generally the preliminary canal alignments were found to be the most practical and feasible and were adopted for the basis of the project design and cost estimate. As design efforts continue and detailed plans and specifications are developed additional minor modifications may be required.

Design considerations concerning the use of pipelines in lieu of open canals were based on the following:

- ❖ Topography
- ❖ Rights-of-way restrictions
- ❖ Relocation of major facilities
- ❖ Highly developed areas
- ❖ Flow volumes to be conveyed

Generally at certain locations within the project area it was more practical and/or efficient to deliver water through pipelines than open canals. In some instances pipelines fit into right-of-way restrictions better than open canals. Also, some reaches had unfavorable depths of cut for an open channel and some reaches had adverse grades requiring a pumped conduit flow in order to deliver water to the demand site. Pipelines were also typically used near the end of a branch in the delivery system where discharges were low enough to be readily conveyed through a conduit of economical size. However, in some cases pipelines were substituted for segments that had been originally planned for canals due to right-of-way limitations.

STRUCTURES

The Grand Prairie Area Demonstration Project is unlike the normal civil works project where life and property are being protected from some natural, unpredictable, uncontrollable event where failure can be devastating. This project is providing water in specific volumes into a controlled system for use as needed for agricultural irrigation. In an attempt to minimize costs without jeopardizing design integrity, design criteria used by the United States Bureau of Reclamation (USBR) was evaluated. Designs based on this criteria offered significant potential for savings both in time and dollars over Corps criteria. Coordination with the USBR and a detailed evaluation of their criteria found that the major difference between Corp's criteria and USBR criteria was the factor of safety on precast concrete pipe and that the USBR makes a distinction between a water containing and a water conveying structure. This distinction is applicable when leakage from a system is critical. An issue resolution conference with Memphis District, MRC, and HQUSACE representatives was conducted

following these findings to discuss a proposal to use the USBR design criteria in the design of structures for the project. It was agreed that USBR design criteria was indeed applicable to the Grand Prairie Project as long as it was interpreted correctly. Use of the criteria has been coordinated throughout the design process. This innovative approach has resulted in significant cost savings in pipelines and water control structures.

FIRST COSTS OF SELECTED PLAN

Table 9 is a summary of the M-CACES cost estimate for the import system and the NRCS cost estimate for the on-farm component. Project costs for the import system (\$201,928,000) and the on-farm component (\$68,584,000) are based on October 1996 price levels and are assumed to be end of year expenditures. The detailed M-CACES, baseline cost estimate, for the Grand Prairie Area Demonstration Project along with a description of the items of work, project features, and contingencies is contained in Volume 7, Appendix B, Section VI, Cost Engineering Report.

Table 9.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Project Cost Summary
(October 1996 Price Levels)

ACCOUNT NUMBER	DESCRIPTION	TOTAL PROJECT COST
01	Land and Damages	\$10,909,000
02	Relocations	\$11,926,400
09	Channel and Canals	\$93,079,481
13	Pumping Plant	\$37,799,423
15	Diversion Structures	\$4,146,935
18	Cultural Resources	\$1,620,000
18	Mitigation	\$123,100
30	Planning, Engineering, and Design	\$13,847,965
31	Construction Management	\$8,817,134
59	Contingencies	\$19,658,773
	On-Farm Component	\$68,584,000
TOTAL PROJECT COST		\$270,512,000(R)

IMPACTS DURING CONSTRUCTION

A plan will be developed which identifies procedures to avoid and/or minimize adverse construction impacts to the region and the environment.

NOISE

Measures will include contract provisions that limit noise to a certain level within a given distance from the construction site. Restrictions will vary depending on the proximity to an urban area and hours of construction.

TRANSPORTATION

Specific routes away from residential and commercial areas will be designated for construction related traffic and remote locations for constructing staging areas. Detour signage will be erected when roads are closed due to utility relocations or other project construction activity.

AESTHETICS

A plan to restore native prairie within the project rights-of-way has been included as a feature of the project. Additional testing will be required to determine the extent and feasibility of this innovation.

SAFETY

Measure will include signage, lighting, and access control during and after construction. Media notices will be released for certain construction activities.

CULTURAL RESOURCES

A cultural resources survey of approximately 95% of the lands within the project right-of-way was conducted. The estimated 5% of lands not surveyed was due to realignments made as a result of the last series of public workshop meetings. Surveys will be performed for these areas during the preparation of plans and specifications. The survey identified 174 historic and prehistoric sites. Prior to construction, testing will be conducted to determine if any cultural resources sites are significant (i.e., eligible for nomination to the National Register of Historic Places). Any significant sites must be avoided during construction or mitigated before construction in the immediate vicinity of the sites.

OPERATION PLAN

A general operation plan and schedule for the import water system was developed in the initial planning stages. Delivery system planning, layout, and design was conducted in consideration of

institutional factors, available water sources, water demands, and the desired delivery system operations, control, and monitoring. The operations procedures for the various project components are included in the preliminary draft operation manual, Volume 3, Appendix B, Section I, Part G.

OPERATIONS AND MAINTENANCE REQUIREMENTS

Within the main canal system there are 18 gated check structures, 103 siphons, 144 turnouts, 180 road crossings, and a fully automated 100 cfs pumping station to provide water into one of the northern areas of the project. The main canal turnouts and lateral turnouts consists of individual gates and pumps to provide water to specific reaches of the project area. Water will be furnished to this system from the White River by a 1640 cfs pumping station operated and controlled by the *Pump Operator*. The entire canal system of gates and pumps (excluding the 1640 cfs major pumping station) will be controlled by a Supervisory Control and Data Acquisition (SCADA) system operated by the *Watermaster*. This system will allow fully automative or operator assisted (manual) operation. The central monitoring station for the main canal control system will be located in the control room of the major pumping station and will be separate form the controls of the pumping station. The controls systems for the major pumping station and the canal network will be capable of interfacing with each other for future total automatic control.

The major pumping station will operate as a supply type station with upstream control. The pumping station is a supply oriented system because the amount of water available from the supply (White River) will determine the operation schedule of the pumping station and the canal flow schedule. The control structures and turnouts having gravity flow or pumps located in the canal system will be operated as a supply type system. The system will be controlled by the *Watermaster* based on real time information of water levels upstream and downstream of the structures and the demands of the water delivery schedule. The control systems for the pumping stations and the canal system will be designed with components requiring low maintenance ease of operation. Volume 5, Section IV, Part B, Electrical, Power, Control Systems and Operations Conditions provides information on the operations of the individual system components and the overall system. Volume 6, Appendix, Section V, Part C and Part D, Mechanical Design Development and Electrical Design Development, respectively, present design, operation and maintenance information of the various components and systems of the major pumping station.

Operation and maintenance played a major role in the design of the concept plan for the major pumping station. Stated goals of the design were that the end product should have good architectural appeal, be easy to maintain, and have operational features that will allow the *Watermaster* to control pumps, valves, and accessories form a central operation control room.

The control and monitoring system for the delivery system operation will be further developed during the preparation of plans and specifications.

Operation and maintenance of the on-farm components of the project will be done by individual farmers.

The delivery system includes features that require various levels of maintenance. Pumping units, gates, and other mechanical and/or electrical devices require maintenance at prescribed intervals for the proper operation and life of the component. Maintenance will include structure upkeep and replacement, pumping plants upkeep and replacement, canal cleanout, and bank stabilization for any slides or erosion that may occur.

The operations and maintenance costs are for a period of 50 years and uses present day cost data.

CANALS AND STREAMS

Canal maintenance includes excavation of sediment, removal of aquatic growth, and slide repairs. Stream maintenance consists of repairs to the low water weirs. Canal maintenance is estimated on a 20 year frequency at a cost of \$2,000 per mile of canal maintenance. This amounts to an annual cost of approximately \$40,000. An annual mowing cost of \$33,750 is based on mowing 25 percent of the canal rights-of-way three times a year at a cost of \$250 per mile of canal mowed. It is assumed that the remaining 75 percent of canal rights-of-way will be utilized for prairie restoration, and burning will be the preferred method of control.

STRUCTURES

Labor costs to operate and maintain the gated structures were estimated at \$120,000 annually and included 4 full time personnel. An annual energy cost of \$55,298 is based on a \$0.047/KWH charge. Replacement cost are estimated at \$800 the first year and increase linearly over the life of the project.

MAJOR PUMPING STATION

Annual operating cost for the 1640 cfs pumping station consist of \$202,269 for labor. This labor estimate was based on 6 full time pumping station employees. An annual energy cost of \$2,123,622 is base on a charge of \$0.047/KWH provided by Entergy Service, Inc., the electric power company serving the project area. An annual demand charge of \$560,078 reimburses the power company for capital expenditures for the substation and power lines needed to supply the major pumping station and guarantees the irrigation district electricity when needed. Replacement cost include \$270,135 every 20 years for the roof, \$210,725 every 35 years for the motor control centers; \$300,890 every 35 years for the electric motor stator; and \$225,670 every 40 years for pump impellers.

100 CFS PUMPING STATION AND SMALL PUMPING STATIONS

Labor costs to operate and maintain the 100 cfs pumping station and the 197 small pumping units were estimated at \$120,000 annually and included 4 full time personnel. An annual energy cost

of \$192,808 is based on a \$0.047/KWH charge. Replacement cost are estimated at \$400 the first year and increase linearly over the life of the project.

SECTION 103(j)(1)

Section 103(j)(1) of the Water Resources Development Act of 1986, P.L. 99-662, states *“Any project to which this section applies (other than a project for hydroelectric power) shall be initiated only after non-Federal interests have entered into binding agreements with the Secretary to pay 100 percent of the operation, maintenance, and replacement and rehabilitation costs of the projects, to pay the non-Federal share of the costs of construction required by this section, and to hold and save the United States free from damages due to the construction or operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors.”*

PLAN ACCOMPLISHMENTS

The selected plan achieves the goals and objectives of the study by providing the best combination of measures for solving the identified water resources problems, realizing possible opportunities, and meeting the current and future needs of the area.

The project was designed to accomplish the following:

- ❖ Protect and preserve the alluvial aquifer;
- ❖ Increase conservation through efficient use and management of all water resources;
- ❖ Provide a supplemental supply of agricultural irrigation water to meet the needs of the area and sustain the economic viability of the region;
- ❖ Provide a dependable water supply for flooding waterfowl feeding and resting areas; and
- ❖ Restore and enhance fish and wildlife resources by providing needed water during traditional low flow periods to maintain minimum instream pools.

SUMMARY OF ECONOMIC, ENVIRONMENTAL, AND OTHER SOCIAL EFFECTS

ECONOMIC ANALYSIS

No project has been identified which provides 100 percent of the irrigation water demand all of the time due to restrictions on withdrawals from the White River. However, the selected plan consistently provides a majority of the area's water needs. The selected plan can provide an average of 243,900 additional acre-feet of water per year for a total available supply of 421,404 acre-feet per year. This level will provide approximately 87.6 percent of an average year's needs. An unmet need

or shortage of 59,791 acre-feet remains which means that a portion of the area will convert to dryland practices and some of the desired winter waterfowl acreage cannot be flooded.

Presently approximately 85 percent of irrigation water comes from groundwater and 15 percent from surface water in the Grand Prairie area. With the project approximately 91 percent of the water will come from surface water (existing runoff capture and import) and only 9 percent from groundwater.

BENEFITS

All project benefits are based on current (October 1996) price levels, estimated over a 50-year project life plus the installation period, and discounted to the end of the project installation period using the current Federal discount rate (7.375%). The project benefits consist of irrigation benefits and waterfowl and fisheries benefits.

COSTS

The project costs, like the annual benefits, are based on current price levels, estimated over a 50-year project life plus the installation period, and discounted to the end of the project installation period using the current Federal discount rate. The annual cost consists of interest, sinking fund, operation, maintenance and replacement charges. Also included in the annual costs are impacts to navigation on the White River and potential induced flooding on existing streams which are used as a part of distribution system.

NAVIGATION

The effects of the selected plan on White River navigation are presented in detail in Volume 10, Appendix D, Section II-8-a., Navigation Impacts. With Implementation of the selected plan the availability of a 9-foot or greater depth navigation channel on the White River would be reduced from 62.5 percent of the time to 60.8 percent of the time, a reduction of approximately 6 days per year. A 10.5 foot or greater depth navigation channel which can support fully loaded 9.5 foot barges would be reduced from 56.3 percent of the time to 55.6 percent of the time, a reduction of less than 3 days per year.

SUMMARY

Table 10 presents a summary of the benefits and costs for the selected plan. The selected plan (NED plan) is the plan preferred by the potential project sponsor. A comparison of the average annual equivalent (AAE) benefits with AAE costs indicates that the selected plan for the Grand Prairie Area Demonstration Project has a benefit-to-cost ratio of 1.2, with excess benefits of \$6,876,000.

Table 10.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Selected Plan

**Summary of First Costs and Average Annual Equivalent (AAE) Benefits,
Costs, Excess Benefits, and Benefit-to-Cost (BCR) Ratio**

BENEFIT/COST CATEGORY	BENEFIT/COST (\$)
FIRST COST	
Import System	201,928,000
On-Farm	68,584,000
Total	270,512,000
ANNUAL BENEFITS	
Irrigation Benefits	35,659,000
Waterfowl Benefits	473,000
Total	36,132,000
ANNUAL COSTS	
Interest	
Import System	17,456,000
On-Farm	6,325,000
Sinking Fund	
Import System	512,000
On-Farm	185,000
Operation & Maintenance	
Import System	
Pump Station	3,130,000
Small Pump Stations	348,000
Structures	209,000
Canals & Streams	42,000
On-Farm	910,000
Navigation Impacts	127,000
Induced Flooding	12,000
Total	29,256,000
EXCESS BENEFITS	
Irrigation Benefits	6,403,000
All Benefits	6,876,000
BCR	
Irrigation Benefits	1.22
All Benefits	1.24

ENVIRONMENTAL EFFECTS OF THE SELECTED PLAN

The selected plan includes components for restoration of prairie vegetation and the annual flooding of 38,525 acres of harvested rice fields for waterfowl. To compensate for impacts associated with construction of the import system, 193 acres of cleared land would be acquired and planted in upland hardwoods; and 243 acres of agricultural land would be acquired and planted in bottomland hardwood trees. Adverse impacts to White River aquatic resources will be minimal, and benefits to aquatic resources in tributary streams will be substantial. Table 11 shows the effects of the selected plan on nationally recognized resources. A detailed description of project-induced environmental impacts and benefits is presented in the accompanying Draft Environmental Impact Statement (DEIS). The U. S. Fish and Wildlife Service has provided a Coordination Act Report included in Volume 9, Appendix C, Section VI.

Table 11.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Effects of the Selected Plan on National and Cultural Resources

TYPES OF RESOURCES	AUTHORITIES	MEASUREMENT OF EFFECTS
Archaeological and Historical	National Historic Preservation Act of 1966, as amended (16 USE 470) and the Archaeological and Historic Preservation Act of 1974, as amended (16 U.S.C. 469a).	Unknown at this time; any significant cultural resources sites will be avoided or mitigated.
Air Quality	Clean Air Act, as amended, 42 U.S.C. 185h-7, et seq.	Very minor impacts during project construction.
Endangered and Threatened Species	Endangered Species Act, as amended, 16 U.S.C. 469a).	No adverse impacts anticipated.
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act, as amended, U.S.C. 661, et seq.	Minimal impacts to White River aquatic resources; substantial benefits to aquatic resources in tributaries. 245 acres of valuable wildlife habitat impacted; mitigated through acquisition and reforestation of 436 acres of cleared land. 38,525 acres of cropland will be annually flooded to benefit waterfowl.

Table 11.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Effects of the Selected Plan on National and Cultural Resources

TYPES OF RESOURCES	AUTHORITIES	MEASUREMENT OF EFFECTS
Prime and Unique Farmland	Farmland Protection Policy Act, Subtitle I of Title XV of the Agriculture and Food Act of 1981 (7 U.S.C. 4201 et seq.) CEQ Memorandum of August 1, 1980; Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing NEPA.	3,695 acres of prime farmland lost.
Floodplains	Executive Order 11988 Floodplain.	Some project features constructed in floodplains; no significant impacts.
Water Quality	Clean Water Act of 1977, as amended, 42 U.S.C. 1857h-7, et seq. Water Quality Act of 1987.	Some short-term degradation during construction; no long-term adverse impacts projected.
Wetlands	EQ 11990, Protection of Wetlands; Clean Water Act of 1977, as amended (42 U.S.C. 1857h-7 et seq.)	128 acres lost (includes 64 acres of farmed wetlands); 57 acres temporarily impacted.
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271 et seq.).	None present.

FUNDING/CONSTRUCTION SCHEDULE

The construction schedule was developed to maximize the national economic development benefits and to initiate project operation before the alluvial aquifer is exhausted. The local sponsor also indicated that minimum time to completion is desired. The construction schedule is the quickest reasonable time to initiate project operation. However, project funding is at the discretion of Congress, and, therefore, any construction scheduling is tentative. Tables 12-A, 12-B, and 13 show the proposed construction schedule and provide summaries of the total project costs by construction item and fiscal year. The Project Management Plan (PMP) provides a detailed schedule of future work and necessary funding.

SCHEDULE DEVELOPMENT

A team consisting of representatives from all functional elements was assembled to develop the construction schedule and determine the total time necessary for project implementation including

the development of design documents and plans and specifications, relocations, rights-of-way acquisition, and construction time.

CONSTRUCTION PHASING

The project was divided into fourteen construction items (Plate 5). These items are complete units and when constructed sequentially would be available for operation. The construction contracts will consist of all work within an item to eliminate potential problems with scheduling different contractors to work on different components within an item. It is anticipated that the main contractor for an item will subcontract work on various components to specialized contractors. Item 1 is the 1640 cfs pumping station which will supply the project with water from the White River. The inlet channel to the pumping station as well as the discharge pipes are included in Item 1. Item 2 is a supply contract for purchase of the pumps for the 1640 CFS Pump Station. Items 3-14 consists of the construction of canals , pipelines, a 100 cfs relift station, check structures, bridges and culverts, turnout structures, siphons, pumps, wasteways, and lowwater weirs. Some items may be combined for contracting in order to expedite construction. However, for design purposes the items will be kept separate. This will provide options to minimize any delays resulting from rights-of-way acquisition problems, relocations delays, cultural resources mitigation, or other occurrences. The design and construction of all pumping station components will be accomplished in concert to insure functionality. The pumps and the access road will be constructed in separate contracts. A separate contract for the access road will enable earlier contract award and minimize delays due to weather and high river stages for this item. Items one through seven are scheduled to be complete when the pumping station is complete. These items encompass the area north and east of LaGrue Bayou and represent approximately 30 percent of the project area. The remaining items, eight through fourteen, will then be completed. A description of the items of work is as follows:

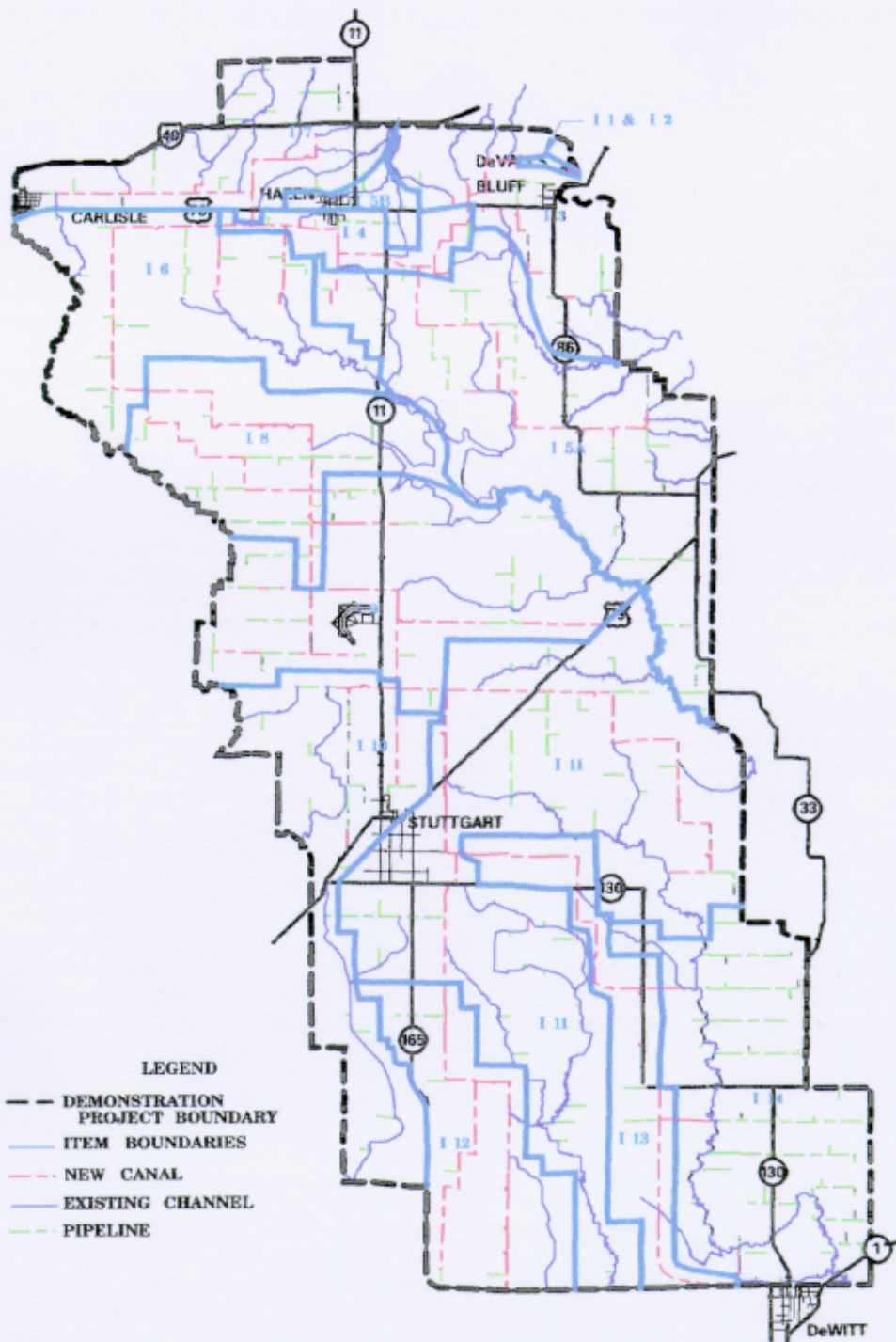
Item 1: A 1640 cfs pumping station which is feed by a 2,000-foot inlet channel from the White River. The Pump Station discharges to the Canal 1000 via twin 10-foot diameter steel pipes.

Item 2: Supply contract for the purchase of the pumps for the 1640 CFS Pump Station.

Item 3: Construction of canals 1000, 1500 and 1520 and pipelines 1300, 1400, 1500, and 1520; and construction of weirs and/or outlets on existing streams 1300, 1400, 1510.

Item 4: Construction of canals 2000A, 2000B, a portion of canal 3000, and pipeline 2000.

Item 5: Construction of canals 2200, 2300, 2400A, 2400B, and 2500, and pipelines 2100, 2200, 2210, 2230, 2240, 2300, 2410, and 2500; and construction of weirs and/or outlets on existing streams 2100, 2210, 2211, 2220, 2230, 2240, 2250, 2260, and 2410.



US Army Corps
of Engineers
Memphis District

EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
ITEM BOUNDARIES

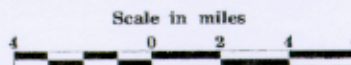


PLATE 5

Item 6: Construction of canals 3100, 3110, 3300, a portion of canal 3000; pipelines 3000, 3110, 3300, and 3400; a mechanical gated structure in canal 3000; and construction of weirs and/or outlets on existing stream 3110.

Item 7: Construction of canals 3200, 3220; pipelines 3200, 3221, 3261; the 100 cfs relift station on canal 3200; and construction of weirs and/or outlets on existing streams 3200, 3210, 3221, 3230, 3240, 3250, 3260, 3261.

Item 8: Construction of canals 3500, 3510, 4050, 4000; pipelines 3500, 4000A, 4000B; a mechanical gated structure in canal 4000; and construction of weirs and/or outlets on existing stream 3510.

Item 9: Construction of canals 4100, 4200, 4400A, 4400B, 4500A, 4500B, 4520, 5000, 5100, 5200A, 5200B; pipelines 4100, 4200, 4300, 4400A, 4400B, 4500, 4510, 4520, 5200; a mechanical gated structure for canal 5000; and construction of weirs and/or outlets on existing stream 5100.

Item 10: Construction of canals 5300A, 5300B, 5310, 5400; pipelines 5300A, 5300B, 5310, 5311P and 5400; and construction of weirs and/or outlets on existing stream 5311.

Item 11: Construction of canals 5500, 6000A, 6300, 6400; pipelines 5500, 5510, 5520, 5530, 6000, 6100, 6300, 6310, 6500; a mechanical gated structure in canal 6000; and construction of weirs and/or outlets on existing streams 5510, 5520, 5530, 6100, 6300, 6310, 6410, 6500.

Item 12: Construction of canals 6000B, 6600; pipeline 6600; and construction of weirs and/or outlets on existing streams 6610.

Item 13: Construction of canals 6200A, 6200B; pipeline 6200; and construction of weirs and/or outlets on existing stream 6210.

Item 14: Construction of canals 6205, 6215, 6216, 6230; pipelines 6100, 6230; and construction of weirs and/or outlets on existing stream 6100.

DESIGN DOCUMENTS

The design documents for the project include the design for the control system, detailed design of the major pumping station, and standard designs for the structures.

The control system design will involve hydraulic and mechanical and electrical design and modeling. The results will determine the type of control system selected and the mechanical and electrical equipment necessary for operation.

The detailed design and preparation of plans and specifications for the major pumping station will be done in accordance with Corps of Engineers criteria. The Hydroelectric Design Center (HDC) in Portland, Oregon will perform these tasks. The Memphis District will perform the site surveys, subsurface investigations and geotechnical analyses as needed by HDC.

Standard designs for the remaining structures will be performed by an A/E contractor or in-house in order to minimize the time to construction. Design memoranda will be prepared in accordance with the provisions of ER 1110-2-1150. These designs will be completed as part of the work order for Item 4 and serve for the remainder of the project. Standard designs will be used to simplify preparation of plans and specifications and will result in cost saving during construction.

PLANS AND SPECIFICATIONS

A single A/E contract for project design will be awarded. Each item will represent a work order. Prior to issuance of a work order for a construction item, archeological testing of identified sites will be performed under separate contract. This will enable avoidance when possible of significant sites. The work order will include all necessary surveying and subsurface exploration for a complete set of plans and specifications. The 30% design submittal will include all necessary information for initiation of rights-of-way acquisition and relocations.

CONSTRUCTION SCHEDULE

The items of work 1 thru 7 were examined in detail and estimates developed for the completion of each item. The contractor was assumed to work six, ten hour days to project completion. Time for weather delays were included in the estimate. From these estimates, the construction schedule for the remaining items was estimated. The construction schedule is presented in detail in the Project Management Plan (PMP). The time to complete the project is estimated to be six years. This schedule will require the local sponsor to acquire the real estate and perform the required relocations in an expeditious manner.

Table 12-A
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Project Cost Schedule
Total of All Accounts
(October 1996 Price Level)

ITEM	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	ITEM TOTAL
	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)
Contract Item 1	325	415	5,262	13,597	13,492	0	0	33,091
Contract Item 2	0	0	0	5,287	5,273	0	0	10,560
Contract Item 3	11	352	936	950	3,418	1,516	0	7,183
Contract Item 4	464	696	1,996	4,515	4,156	679	0	12,507
Contract Item 5A	307	336	1,058	5,170	4,333	1,426	0	12,629
Contract Item 5B	0	0	112	163	1,144	357	0	1,776
Contract Item 6	335	1,177	985	6,030	5,616	0	0	14,144
Contract Item 7	165	165	700	792	2,252	3,227	0	7,300
Contract Item 8	0	271	1,186	1,229	5,327	5,176	1,543	14,732
Contract Item 9	0	452	1,240	1,414	7,558	7,899	2,300	20,862
Contract Item 10	0	235	532	614	4,210	4,598	1,320	11,509
Contract Item 11	0	547	1,781	1,874	8,301	8,152	2,398	23,052
Contract Item 12	0	254	765	779	2,845	2,602	770	8,015
Contract Item 13	0	351	805	854	5,003	5,248	1,510	13,773
Contract Item 14	0	258	595	1,088	3,765	3,964	1,125	10,796
On-Farm	9,797	9,797	9,798	9,798	9,798	9,798	9,798	68,584
FY TOTAL	11,404	15,306	27,749	54,156	86,492	54,643	20,764	270,512

Table 12 - B
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Project Cost Schedule
Total of All Accounts
(October 1999 Price Level)

ITEM	FY 1999 (\$000)	FY 2000 (\$000)	FY 2001 (\$000)	FY 2002 (\$000)	FY 2003 (\$000)	FY 2004 (\$000)	FY 2005 (\$000)	FY 2006 (\$000)	ITEM TOTAL
Contract Item 1	2,451	16,250	6,020	18,894	2,877				46,492
Contract Item 3		497	1,110	1,512	4,143				7,262
Contract Item 4		787	2,383	5,233	4,452				12,855
Contract Item 5A		347	2,186	4,025	6,116				12,674
Contract Item 5B			200	238	1,244	97			1,779
Contract Item 6		389	1,208	3,870	6,345	2,455			14,267
Contract Item 7		167	640	1,667	2,197	2,159	504		7,334
Contract Item 8		135	3,200	5,806	3,607	2,483	463		15,694
Contract Item 9		135	3,725	8,020	4,200	4,100	1,960		22,140
Contract Item 10		240	640	3,600	4,302	1,930	1,575		12,287
Contract Item 11		570	2,095	8,777	6,132	4,850	1,726		24,150
Contract Item 12		90	1,039	3,625	1,850	1,091	700		8,395
Contract Item 13		90	2,044	7,476	951	3,665	371		14,597
Contract Item 14		90	2,160	3,481	1,147	3,320	671		10,869
On-Farm	1,465	17,576	10,047	24,698	9,723	6,216	264		69,989
FY TOTAL	3,916	37,363	38,697	100,922	59,286	32,365	8,234	0	280,784

¹ Does not include \$11,584 in sunk PED costs.

Represents a price level increase of \$10.2 million updating from October 1996 to October 1999

Table 13.
GRAND PRAIRIE AREA DEMONSTRATION PROJECT
Project Cost Schedule
Total of All Accounts (Fully Funded)
(October 1999 Price Level)

ITEM	FY 1999 (\$000)	FY 2000 (\$000)	FY 2001 (\$000)	FY 2002 (\$000)	FY 2003 (\$000)	FY 2004 (\$000)	FY 2005 (\$000)	FY 2006 (\$000)	ITEM TOTAL
Contract Item 1	2,701	16,600	6,505	19,894	3,577				49,277
Contract Item 3		522	1,442	1,592	4,165				7,721
Contract Item 4		837	2,684	5,553	4,638				13,712
Contract Item 5A		387	2,436	4,167	6,678				13,668
Contract Item 5B			205	245	1,354	115			1,919
Contract Item 6		409	1,268	4,140	6,745	2,831			15,393
Contract Item 7		172	677	1,730	2,337	2,459	549		7,924
Contract Item 8		150	3,376	6,096	3,957	2,983	500		17,062
Contract Item 9		150	4,025	8,391	4,700	4,780	2,084		24,130
Contract Item 10		260	670	3,790	4,697	3,248	720		13,385
Contract Item 11		600	2,195	9,647	6,482	6,900	676		26,500
Contract Item 12		100	1,176	3,890	1,970	1,136	920		9,192
Contract Item 13		100	2,175	7,962	1,071	2,815	2,190		16,313
Contract Item 14		100	2,331	3,679	1,347	4,663	13		12,133
On-Farm	1,502	19,439	10,917	27,598	12,023	5,899	1,709		79,087
FY TOTAL	4,203	39,826	42,082	108,374	65,741	37,829	9,361	0	307,416

¹ Does not include \$11,584 in sunk PED costs.

PLAN IMPLEMENTATION

INSTITUTIONAL REQUIREMENTS

Pertinent state of Arkansas statutes to include acts or amendments to statutes concerning surface and groundwater regulation and irrigation districts include:

- ❖ Arkansas Code Annotated of 1987
 - + Irrigation, Drainage, and Watershed Improvement District Act
 - + Development and Use of Water Resources Generally
 - + Determination of Water Use Requirements
 - + Arkansas Groundwater Protection and Management Act
- ❖ Act 1051 of 1985
- ❖ Act 154 of 1991
- ❖ Act 342 of 1991
- ❖ Act 838 of 1995

LEGAL

The Memphis District contracted for the services of Dr. J. W. Looney of the University of Arkansas, Lefflar School of Law, in Fayetteville, Arkansas to conduct a detailed review of existing state legislation and case law to catalogue existing state law and regulations regarding the use of groundwater and the non-riparian use of surface water. Dr. Looney is recognized as the preeminent authority on water law in the state of Arkansas. The purpose of this study was to review the current status of Arkansas law with regard to the institutional and legal framework relating to the utilization of water resources in the state. In particular, the focus was on those statutory, regulatory and judicial approaches that either promote or hinder the full development of both surface and groundwater. This also included state efforts and policies directed towards conserving, preserving and protecting these valuable resources. Issues and questions that must be addressed in order for the proposed project to transfer and utilize White River water and for the White River Regional Irrigation Water Distribution District (WRRIWDD) to sponsor and operate the project were identified.

Dr. Looney completed a report entitled "Institutional and Legal Aspects of Project Development and Implementation" in November 1994 which presented the results of his investigations. The major impediments to successful project development and operation identified in the report fall into two categories: (1) Those related to uncertainty in the general law regarding groundwater and surface water utilization; and (2) Those related to authority of special water distribution districts created under Act 114 of 1957.

A number of specific deficiencies were identified in Arkansas law which served as obstacles to the development and implementation of the proposed Grand Prairie Area Demonstration Project and, in particular, the functions of the WRRIWDD. The report provided recommendations on: (1) Revision in Rules; (2) Water Utilization: Legislative Recommendations; (3) District Authority: Legislative Recommendations; and (4) An Alternative Proposal.

Legislation was introduced in the 1995 Arkansas General Assembly to deal with most of the identified problems. Major modifications of the existing laws related to Regional Water Distribution Districts were made. To complete the earlier review, the services of Dr. Looney were utilized to research and identify any remaining legal and institutional barriers to project development and implementation and WRRIWDD's financing and operation of the project. A detailed discussion of the 1995 changes and a summary of proposed legislation for 1997 is included in Dr. Looney's report "The Legal and Institutional Barriers that Remain to Project Development and Implementation", October 1996.

Volume 11, Appendix F contains a copy of the November 1994 and October 1996 reports.

PERMITS AND COMPLIANCE

In order for the project to be built and operated, certain permits must be granted and certified by select Federal and state agencies. The following Federal and state review and/or permit requirements are applicable to the Grand Prairie Area Demonstration Project. It is the sponsor's responsibility to obtain the necessary permits for water withdrawals from the state. HQUSACE will provide guidance on who bears the cost associated with obtaining those permits.

SECTION 404

The authority to regulate discharges of dredged (excavated) or fill material in waters of the United States (including wetlands) was given to the Corps of Engineers with passage of the Federal Water Pollution Act Amendments. This Act was later changed to the Clean Water Act in 1977. The regulation of materials into or from rivers, streams, lakes, and wetlands is intended to "restore and maintain the integrity of the Nation's waters".

SECTION 10

Since 1899, the Corps of Engineers has had authority to regulate any work activity performed over our Nation's navigable waters. Structures, intakes, and any other impacts are included under this jurisdictional mandate.

NON-RIPARIAN PERMIT

The Arkansas Soil and Water Conservation Commission may authorize the transportation of excess surface waters to nonriparians under provisions of Statute 15-22-304. Procedures for

application as well as delineation of “excess surface waters” are contained in this statute. For purposes of transfer of excess surface water in the White River Basin, the transfer amount shall not exceed on a monthly basis an amount which is 50% of the monthly average of each individual month of excess surface water.

WATER PLAN COMPLIANCE REVIEW

Under Title VI in the ASWCC’s “Rules For Water Development Project Compliance With The Arkansas Water Plan”, all water development “projects”, excluding sewage disposal, industrial waste, or other waste treatment systems, shall be subject to review and approval by ASWCC. A written application in accordance with Subtitle II must accompany the filing correspondence.

DAM SAFETY PERMIT

If a dam or levee is 25 feet or more in height and impounds 50 acre-feet or more, issuance of a dam permit is required by ASWCC. The permit should be obtained before actual construction begins on the dam or levee.

DIVISION OF PLAN RESPONSIBILITIES

This section presents pertinent information concerning non-Federal and Federal responsibilities regarding cost sharing and the division of responsibilities for construction and subsequent operation, maintenance, repair, replacement, and rehabilitation of the selected plan.

LOCAL COOPERATION REQUIREMENTS

Provide all lands, easements, and rights-of-way including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;

Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project;

Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the total project costs;

For so long as the project remains authorized, acquire, secure, and maintain the quantity of water that the Government determines is necessary for the construction, operation, and maintenance of the project. The cost of acquiring, securing, and maintaining such water shall be an associated cost

of the project and shall be paid 100 percent by the non-Federal sponsor and shall not be shared as a part of the total project costs;

Provide 35 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to agricultural water supply that are in excess of one percent of the total amount authorized to be appropriated for agricultural water supply;

Hold and save the United States free from damages due to the construction and operation of the project, except for damages due to the fault or negligence of the United States or its contractors;

Operate, maintain, repair, replace and rehabilitate all completed works in accordance with regulations prescribed by the Secretary of the Army;

Prevent future encroachment or modifications which might interfere with proper functioning or maintenance of the project, including all conveyance facilities constructed or improved as a part of the project;

Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project;

Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs;

Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government;

Assume complete financial responsibility, as between the Federal Government and the non-Federal interests, for the cleanup of any hazardous material located on project lands and regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and be responsible for operating, maintaining, repairing, replacing and rehabilitating the project in a manner so that liability will not arise under CERCLA;

Comply with the applicable provisions of the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646), as amended by Title IV of the Surface Transportation and Uniform Relocations Assistance Act of 1987 (PL 100-17);

Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, approved December 31, 1970 which provides that the construction of any water resources project by the Corps of Engineers shall not be started until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project; and

Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (PL 88-352) that no person will be excluded from participation in, denied the benefits of, or subjected to discrimination in connection with the project on the grounds of race, creed, or national origin.

PROJECT COOPERATION AGREEMENT

Section 103(j) of the Water Resources Development Act (WRDA) of 1986, Public Law 99-662, mandates that a project shall be initiated only after non-Federal interests have entered into a binding agreement with the Secretary to pay 100 percent of the operation, maintenance, and replacement and rehabilitation costs of the project, to pay the non-Federal share of the costs of construction required by this section, and to hold and save the United States free from damages due to the construction or operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors. That binding agreement is known as a Project Cooperation Agreement (PCA). The Economy Act, 31 U.S.C. 1535, provides the authority for agencies of the Federal Government to reimburse other agencies of the Federal Government for services. It has been determined that the NRCS can be used as the construction agent to implement the on-farm features under the Economy Act due the NRCS's experience and expertise in these types of features. For the on-farm features implemented by the NRCS, the NRCS's normal procedures to protect the Federal invest through the use of long term contracts and maintenance agreements will be used. The sponsor will not be required to obtain lands, easements and rights-of-way necessary to operate and maintain the on-farm features and no credit will be given for the lands, easements, and rights-of-way for the on-farm features for which the NRCS acts as the construction agent. The long term contracts and maintenance agreements will be in force as long as the project is authorized. The NRCS has indicated their support for the project and their willingness to act as construction agent, given necessary funding. A memorandum of agreement will be negotiated with the NRCS and included in the PCA package. The model PCA will be modified to enable the use of the NRCS as the construction agent for the on-farm features.

The Arkansas Soil and Water Conservation Commission has indicated their intent to serve as local sponsor for the project and assume the responsibilities of local cooperation.

FINANCIAL DOCUMENTATION

The letter of intent and financing plan along with pertinent cost sharing information and the Commander's Assessment of Financial Capability is included in the Financial Documentation section of this report.

FEDERAL RESPONSIBILITIES

CORPS OF ENGINEERS

The Corps of Engineers is responsible for the implementation of the project. Due to the NRCS's expertise in implementing on-farm features, it was determined that they should be used as the construction agent for these features. An Memorandum of Agreement will be negotiated with the NRCS to fully describe their involvement in implementing the on-farm features. The Corps of Engineers will be responsible for the planning, engineering, design and construction of all components of the import system to make water accessible to individual properties in the project area. Completion of design memoranda, as needed, and plans and specifications for project construction; review and approval of real estate appraisals; contraction and supervision of construction; inspection of completed work; and performance of all related requirements necessary for project implementation of the delivery system will be the responsibility of the Memphis District. Activities will be conducted by in-house personnel, hired labor, A/E contracts, other private sector services, other Corps of Engineers personnel, other Federal agencies, construction contracts, and the non-Federal sponsor.

NATURAL RESOURCES CONSERVATION SERVICE

The determination was made that NRCS had the authority to act as the construction agent for the on-farm features under the Economy Act. The NRCS indicated that, given the necessary appropriation, they have the necessary authorities and would make resources available to implement the on-farm features. A Memorandum of Agreement will be developed with the NRCS to enable their use to design and construct the on-farm features. This includes all conservation measures, management strategies, and retrofit of existing irrigation systems to utilize the delivery system. This component also includes provisions for providing waterfowl feeding and resting areas during the fall and winter months. The plans and specifications necessary for construction, along with the operation and maintenance plans and environmental features, will be fully developed in on-farm plans by the NRCS. The on-farm plans will form the basis of the long term contracts and maintenance agreements used to protect the Federal investment. Typical Corps of Engineers procedures would require that the sponsor acquire the necessary lands, easements, and rights of way for project construction, operation, and maintenance. The PCA would then stipulate that the Corps has the right, without relieving the sponsor of the responsibility, to assume operation and maintenance if the operation and maintenance is not performed according to the operation and maintenance plan. In the case of the on-farm features, this is neither practical nor desirable. Operation of the on-farm features to maximize the benefits would require essentially normal farming procedures and flowage easements would be required for the waterfowl flooding. The typical NRCS contracts and binding agreements

will be used to ensure construction and OMRR&R for as long as the project is authorized. The sponsor will not be required to obtain an interest in the land for operation and maintenance due to the nature of the on-farm features. The lands, easements, and right-of-way for construction will not be included in the total project costs and credited to the sponsor. The sponsor will be required to ensure OMRR&R for the on-farm features.

COST APPORTIONMENT

A summary of fully funded non-Federal and Federal costs, by fiscal year, is presented in Table 14. The costs used for cost allocation were the total project costs minus the estimated costs for cultural resources mitigation. Cultural resources mitigation costs are a Federal responsibility up to 1 percent of the total project costs. Section 103(c)(3) of the Water Resources Development Act (WRDA) of 1986 assigned the non-Federal share of the cost for agricultural water supply at 35 percent. The local sponsor is responsible for the LERRDs and the additional cash to equal 35 percent of the project costs. To calculate the annual cost apportionment, the project costs for each year were examined. The sunk PED costs were recovered during the first year of project construction. The non-Federal cash requirement was determined by multiplying the costs for each fiscal year by 35 percent. The value of the LERRDs for each year was subtracted from the total. The remainder is the estimated non-Federal cash contribution for each fiscal year.

Table 14
Project Cost Sharing Summary Including On-farm Features
(All Cost in Thousands of Dollars)

Year	TOTAL PROJECT COST ¹			LERR&D			CONSTRUCTION				TOTAL FEDERAL COST	
	Non-Fed Subtotal	Federal Subtotal	Total ¹	Non-Fed	Federal	Total	Non-Fed Cash	Federal	Total	%	Total Federal (Includes CR Mitigation) ³	
PRIOR		15,767	15,767					15,767	15,767		15,787	
2 (FY00)	19,348	20,478	39,826	4,138	0	4,138	15,210 ²	20,478	35,688	17.6	20,478	
3 (FY01)	22,486	19,326	41,812	14,376	0	14,376	8,110	19,326	27,436	9.4	19,596	
4 (FY02)	35,965	71,445	107,410	5,984	0	5,984	29,981	71,445	101,426	34.6	72,409	
5 (FY03)	19,272	45,923	65,195	2	0	2	19,270	45,923	65,193	22.3	46,469	
6 (FY04)	11,182	26,647	37,829	0	0	0	11,182	26,647	37,829	12.9	26,647	
7 (FY05)	2,747	6,614	9,361	0	0	0	2,747	6,614	9,361	3.2	6,614	
TOTAL	111,000 ⁴	206,200	317,200	24,500	0	24,500	86,500	206,200	292,700	100.0	208,000	

¹ The total project costs (TPC) used for cost allocation are the total costs minus the estimated costs for cultural resources mitigation. This is a Federal cost up to 1% of TPC. The \$1,800,000 for cultural resources testing is included in the TPC and is cost shared in the same manner as the project.

² Includes proportionate non-Federal share of sunk PED costs.

³ Includes 65% of TPC plus cost of cultural resources mitigation.

⁴ Non-Federal share of TPC is 35%.

VIEWS OF NON-FEDERAL SPONSOR

The Arkansas Soil and Water Conservation Commission (ASWCC) is the agency given specific authority and designated as the agency responsible for water resources planning at the state level in Arkansas. The state of Arkansas, represented by the ASWCC, acted as the cost sharing sponsor for feasibility phase studies contributing approximately \$1.2 million dollars to the effort. The Grand Prairie Area Demonstration Project was developed in coordination with and consideration of the Arkansas State Water Plan, a comprehensive master plan developed by the ASWCC to serve as the primary water policy document for the protection, development, and management of water resources in the state of Arkansas. The ASWCC strongly supports implementation of the Grand Prairie Area Demonstration Project.

The commitment by the WRRIWDD to project implementation is quite evident by the investment of resources that have been allocated to the project. They have: 1) conducted an intensive information/education program to educate farmers and the general public on the critical need for protecting the groundwater resource and preserving the area's agricultural economy; 2) established an office, employed an executive director, an administrative assistant, and legal counsel to coordinate local sponsor activities and move the project forward; 3) provided all access permits and conducted numerous other activities to assist the Corps of Engineers and NRCS in the completion of the general reevaluation; 4) identified amendments needed to existing legislation to allow irrigation districts to make the required assurances necessary for participation in and sponsorship of a Federal project; and 5) expended several man years and thousands of dollars promoting the project.

SUMMARY OF COORDINATION

Numerous coordination and public involvement activities were planned and conducted throughout the course of the general reevaluation. These activities included formal public meetings, information workshops, status reports, informal briefings, presentations, site visits, and numerous other correspondence with Federal, state and local environmental, fish and wildlife, navigation, agriculture, and other interest groups and individuals. Input in the identification of problems, needs, and opportunities; planning and development of the project to include layout and alignment, fish and wildlife features, conservation measures, and design considerations; and assistance in conducting planning and engineering field activities was provide by numerous interests.

STUDY COORDINATION

OTHER FEDERAL AGENCIES

The NRCS had a major role in the planning and development of the project. The study team included representatives from the NRCS. The NRCS had total responsibility for the planning and design of the on-farm portion of the project. They totally support project implementation.

The U. S. Fish and Wildlife Service (USFWS) has been involved throughout the study process. Comments and recommendations for project planning and development were provided in a planning aid report early in the planning process. The USFWS has participated in coordination meetings, in-progress reviews, issue resolution conferences, site visits, data collection and analyses. A draft Coordination Act Report (CAR) has been provided and is included in Volume 9, Appendix C, Section II.

STATE AND LOCAL AGENCIES

Coordination with the ASWCC has been a two way street throughout the course of the study as the Memphis District conducted the general reevaluation and as the ASWCC conducted White River studies in conjunction with the Arkansas State Water Plan (SWP). ASWCC input and data was essential in demand and supply analyses for the demonstration project. The Grand Prairie Area Demonstration Project was developed in close coordination with the ASWCC consistent with policy and purpose stated in the SWP which is to protect and preserve the water resources of the state of Arkansas. ASWCC strongly supports the project.

The Arkansas Game and Fish Commission (AGFC) conducted fish sampling to determine the quality of fisheries in existing irrigation canals to evaluate potential fisheries value of project canals. Coordination with the AGFC continued throughout the study particularly on fish and wildlife features and issues and concerns on the potential impacts of the project to fish and wildlife.

Special action teams were formed during the general reevaluation for a specific function or development of a specific project feature. One of these teams, a coalition of Federal, state and local agencies identified as the Waterfowl Joint Venture Team, was assembled to develop a plan to provide additional waterfowl habitat within the project area. This joint venture was developed under the auspices of the North American Waterfowl Management Plan. The Waterfowl Joint Venture Team included representatives from the Corps of Engineers, NRCS, WRRIWDD, USFWS, AGFC, National Biological Service, and Ducks Unlimited. Another team, the Prairie Restoration Team, whose purpose was to develop a prairie restoration plan for the Grand Prairie included membership from the Corps of Engineers, NRCS Plant Materials Center, WRRIWDD, USFWS, AGFC, and Arkansas Natural Heritage Commission (ANHC).

NAVIGATION INTERESTS

Numerous correspondence and meetings were conducted with navigation interests at the state and local level concerning project impacts to navigation. Extensive data collection and analyses were performed to address the issues and concerns expressed and to minimize impacts on the White River. Navigation interests included the Arkansas Waterways Commission, White River Valley Association, Waterborne Commerce of the United States, ASWCC, local barge and tow companies, private companies, and other local interest groups.

PUBLIC VIEWS AND COMMENTS

Public involvement is discussed in previous sections of this report. A summary of the coordination of the GRR to include comments from other agencies and the public is included at the front of this report.

CONCLUSIONS

I have reviewed the report and believe it to be responsive to the Congressional direction and HQUSACE special instructions which directed and funded a study to develop implementation plans for a demonstration project for agricultural water supply, groundwater management and conservation.

Water is the lifeblood of eastern Arkansas. The economy of the region and its people are dependent upon it. Now one of the most serious and far reaching problems that faces the eastern Arkansas region is groundwater depletion. Depletion of the alluvial aquifer is threatening the future of the industry that supports the region - agriculture. This life-sustaining resource has been exhausted to only the perennial yield in areas and may be permanently damaged if action is not taken.

The most critical groundwater depletion area in eastern Arkansas is the Grand Prairie. The Grand Prairie is a major rice and soybean producing area providing a substantial part of Arkansas's rice production which is approximately 42 percent of the nation's production. The Grand Prairie is truly a unique and rare natural resource. It is part of the most important wintering area for mallards in North America. This historic region has a significant portion of the few remnants of natural prairie in Arkansas.

Existing water sources cannot meet the current or future agricultural water needs. An alternative water source must be developed if agriculture is to continue to support the economy of the area and provide food for this nation and the world. Measures to increase the efficiency of current irrigation and conserve water must be an integral part of any plan.

The economic results of exhausting the aquifer would be catastrophic. The social well being of the people would be jeopardized. The environment would be severely impacted as competition for existing water sources increases. The consequences of aquifer depletion can be prevented or at least limited by providing a supplemental source of irrigation water, thereby maintaining the aquifer at a level which would allow for a sustained yield. The implementation of the proposed project may require regulation of groundwater use with adequate diversion of White River water to meet the needs. The only viable solution to eastern Arkansas's groundwater problem is an alternative water supply in conjunction with conservation.

This project has provided the opportunity for private, local, state and Federal interests to work together to develop a plan that incorporates measures to address many of the problems and needs of the area including groundwater protection and conservation, agricultural water supply, water quality, waterfowl management, fish and wildlife restoration, and other water resources purposes.

The White River Regional Irrigation Water Distribution District and the state of Arkansas know the value of the area's natural and environmental resources and are committed to their protection and preservation. The conservation and protection of our natural resources is an investment in the future and I believe this project is in the best interest of the state of Arkansas and our Nation.

RECOMMENDATIONS

I have carefully considered the many significant factors related to the groundwater problems and associated opportunities in the Grand Prairie region of eastern Arkansas and the selected plan to address these problems and opportunities. These factors include the economic and social damages caused by the loss of one of Arkansas' most important resources and the probability for devastation of the regional economy; the need to restore and preserve the natural environment; the need to restore and enhance the fish and wildlife habitat; the plan's completeness, effectiveness, efficiency, and acceptability in meeting the planning objectives; the plan's correlation with the "Arkansas State Water Plan"; the cost and benefits of the plan; and the acceptability of the plan to the potential local sponsor and other Federal, state and local interests. In consideration of all these factors, I have determined that the following recommendations are in the public interest.

I recommend that this report and the improvements described in this report be approved as the basis for proceeding to the development of design memoranda, as needed, preparation of plans and specifications and subsequent project construction, with any such modifications by the Commander, HQUSACE that may be advisable, in accordance with cost-sharing and financing arrangements satisfactory to the President and the Congress. The total first cost of the plan is currently estimated to be \$270,512,000. The non-Federal and Federal cost breakdown is presented in Table 14 with three possible scenarios dependent upon HQUSACE guidance on cost sharing for on-farm features. The annual operation, maintenance, repair, replacement, and rehabilitation costs for the plan are estimated to be \$4,639,000. Project features include a major pumping station and a network of new canals, existing streams, pipelines, and associated hydraulic structures to import water from the White River to the water-depleted Grand Prairie. Included as an integral part of the plan are conservation and fish and wildlife restoration and management features. The selected plan is in direct accord with the project reauthorization contained in the Water Resources Development Act (WRDA) 1996, Public Law 104-303, for the Grand Prairie portion of the *Grand Prairie Region and Bayou Meto Basin, Arkansas* project. This recommendation is made with the provision that, prior to project implementation, non-Federal interests must agree to comply with the following requirements:

- a. Provide all lands, easements, and rights-of-way including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;
- b. Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be

required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project;

c. Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the total project costs;

d. For so long as the project remains authorized, acquire, secure, and maintain the quantity of water that the Government determines is necessary for the construction, operation, and maintenance of the project. The cost of acquiring, securing, and maintaining such water shall be an associated cost of the project and shall be paid 100 percent by the non-Federal sponsor and shall not be shared as a part of the total project costs.

e. Provide 35 percent of that portion of total cultural resource preservation mitigation and data recovery costs attributable to agricultural water supply that are in excess of one percent of the total amount authorized to be appropriated for agricultural water supply;

f. Hold and save the United States free from damages due to the construction and operation of the project, except for damages due to the fault or negligence of the United States or its contractors;

g. Operate, maintain, repair, replace and rehabilitate all completed works in accordance with regulations prescribed by the Secretary of the Army;

h. Prevent future encroachment or modifications which might interfere with proper functioning or maintenance of the project, including all conveyance facilities constructed or improved as a part of the project;

i. Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project;

j. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs;

k. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government;

l. Assume complete financial responsibility, as between the Federal Government and the non-Federal interests, for the cleanup of any hazardous material located on project lands and regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and be responsible for operating, maintaining, repairing, replacing and rehabilitating the project in a manner so that liability will not arise under CERCLA;

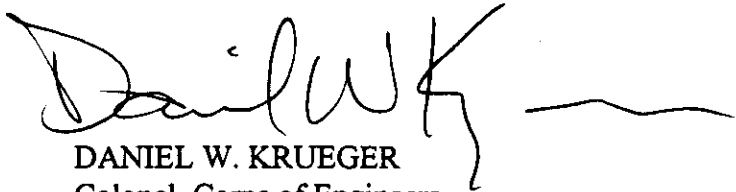
m. Comply with the applicable provisions of the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646), as amended by Title IV of the Surface Transportation and Uniform Relocations Assistance Act of 1987 (PL 100-17);

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, approved December 31, 1970 which provides that the construction of any water resources project by the Corps of Engineers shall not be started until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project; and

o. Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (PL 88-352) that no person will be excluded from participation in, denied the benefits of, or subjected to discrimination in connection with the project on the grounds of race, creed, or national origin.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified during the review and approval process. However, the sponsor, the state of Arkansas, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

14 OCT 1999
Date

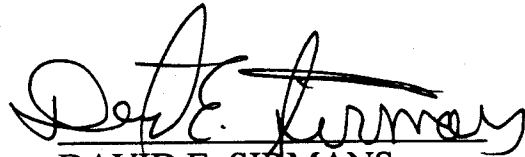

DANIEL W. KRUEGER
Colonel, Corps of Engineers
District Engineer

CERTIFICATION OF LEGAL REVIEW

The substantially revised General Reevaluation Report for the Eastern Arkansas Region Comprehensive Study, Grand Prairie Area Demonstration Project, including all associated documents required by the National Environmental Policy Act, has been fully reviewed by the Office of Counsel, Memphis District, and is approved as legally sufficient contingent on processing of the required National Environmental Policy Act documents.

10/1/99

Date

A handwritten signature in dark ink, appearing to read "D. E. Sirmans", written over a horizontal line.

DAVID E. SIRMANS

District Counsel

**EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY**

**GRAND PRAIRIE AREA
DEMONSTRATION PROJECT**

**FINANCIAL
DOCUMENTATION**

SEPTEMBER 1999

Commander's Assessment
of the
Non-Federal Sponsor's Financial Capability
for the
Grand Prairie Region and Bayou Meto
Basin, Arkansas Project-Grand Prairie
Demonstration Project

Memphis District

October 6, 1999

Introduction

This assessment evaluates the Arkansas Soil and Water Conservation Commission's (Commission) ability to provide its financial obligations for the Grand Prairie Area Demonstration Project as described in the Grand Prairie Region and Bayou Meto Basin, Arkansas Project General Reevaluation Report, dated July 1998. The Commission's financing plan and statement of financial capability consist of a letter dated July 27, 1999 from Mr. J. Randy Young, Executive Director/Ex-Officio Secretary of the Arkansas Soil and Water Conservation Commission to Colonel Daniel W. Krueger, District Engineer. Included in the letter are a schedule of non-Federal construction expenditures and a schedule of expected annual operation, maintenance, and replacement costs. The Financing Plan calls for the Commission to meet its project financial obligations with funds from the following:

- (1) The Arkansas Water Development Fund;
- (2) The Arkansas Water Resources Cost Share Revolving Fund;
- (3) Proceeds from the sale of the Arkansas Water, Waste Disposal and Pollution Abatement Facilities General Obligation Bonds;
- (4) Project operation and maintenance provided through a contract with the White River Regional Irrigation Water District.

Construction

Commission's Plan for Construction. The total project cost is currently estimated at \$307,416,000. The non-Federal share is \$111,000,000 or 35 percent of the total project cost. The non-Federal figure is composed of \$83,320,000 for the Import System and \$27,680,000 for On-Farm Features. The Import System costs are comprised of \$24,500,000 for lands, easements, rights-of-way, and relocations (LERRD) and \$58,820,000 in cash. The On-Farm costs are comprised solely of cash for construction. The Financing Plan calls for the Commission to provide the necessary construction funding through one, or a combination, of any of the following three sources: (1) The Arkansas Water Development Fund, (2) The Arkansas Water Resources Cost Share Revolving Fund, and (3) Proceeds from the sale of the Arkansas Water, Waste Disposal and Pollution Abatement Facilities General obligation Bonds. All LERRD's and other construction requirements will be fulfilled by the revenues generated by these three sources. The total non-Federal obligations are presented in Table 1 by Fiscal Year.

Arkansas Water Development Fund. This fund can be used for a wide range of project purposes. The range of purposes in order of ranking are: public water supply, irrigation (water conservation), flood control and/or drainage, erosion and sediment control, streambank and stabilization, recreational and/or fish and wildlife, hydroelectric power, and navigation. The Fund can provide assistance in the form of: loans (5.00%), grants, deferred loans (5.00%) with interest waived for up to 10 years and payments on principal deferred for up to 10 years, and joint ventures where the Commission becomes co-owner of the project.

Table 1
 Summary of Non-Federal Construction Costs
 Grand Prairie Area Demonstration Project
 (Fully Funded Costs, Includes Estimates for Inflation, \$000)

Fiscal Year	Import System			On-Farm Features	Total
	Cash	LERRD	Total		
2000	11,278	4,138	15,416	3,932	19,348
2001	5,765	14,376	20,141	2,345	22,486
2002	20,939	5,984	26,923	9,042	35,965
2003	12,130	2	12,132	7,140	19,272
2004	6,961		6,961	4,221	11,182
2005	1,747		1,747	1,000	2,747
Total	58,820	24,500	83,320	27,680	111,000

Arkansas Water Resources Cost Share Revolving Fund. This fund was established by the Arkansas Water Resources Cost Share Finance Act 257 of 1989. It authorizes the Commission to provide up to 25% of total project cost in grants and loans for the purpose of funding the non-Federal share of their financial obligations required under any local cooperative agreement entered into with the Federal Government in connection with financing a water resources development project. It can be used for: construction, replacement, acquisition, and ownership of facilities; land and easement procurement; improvements for developing and utilization of water resources; projects to supply quality water to residents; provide water for navigation; provide recreational access to lakes and streams; reclaim, preserve and protect the State's land resources; and protect the wealth of the State from disastrous floods. The types of assistance provided by this fund include: grants, loans, and deferred loans of up to 30 years or life of the project, whichever is less.

Arkansas Water, Waste Disposal and Pollution Abatement Facilities General Obligation Bond Program. These bonds can be used for projects that meet public use tests as prescribed by the Federal tax code for tax exempt bond issues. The types of projects they can be used for include: storage, irrigation, treatment, distribution, and water supply. These bonds provide assistance for up to 30 years or the life of the project, whichever is less. They are issued at the State's current market tax-exempt interest rate for general obligation bond issues.

Assessment of the Commission's Plan for Construction. The Commission is responsible for \$111 million or 35 percent of the project cost. It plans on providing its share of costs from one of two State sponsored funds or a State sponsored bond program or any combination of the three. The two funds require appropriations from the State Legislature and approval by the Governor. The bond program, which will probably be the primary funding source, does not. This project has enjoyed strong support from the State Legislature and the Governor. As evidence of this support, the State through the Commission has previously provided funding in excess of \$2 million for feasibility studies and has provided a significant portion of the funding necessary to operate the White River Regional Irrigation Water Distribution District (Irrigation District) which will operate and maintain the project after construction is completed. Also, the State has more than ample capability to issue and service \$111 million of general obligation bonds.

Although the Commission has the ability to issue \$111 million in bonds, this will probably not be necessary. Besides any money appropriated to the two funds, the individual landowners will probably be required to repay the approximately \$28 million in on-farm feature costs. This will provide additional funds to meet the Commission's commitments as the landowner's payments are received.

The primary risk associated with the Commission's plan for construction will probably rest with the on-farm features. Some landowners may be unable to provide their share of funding prior to construction if required by the Commission. This may prevent a portion of the on-farm features from being built in a timely manner. However, this would not create any financial risk for the Federal Government. Federal funds for the potentially affected features will not be expended prior to the Commission's provision of matching funds. The only real risk will be with the project's ability to provide its designed level of benefits. This risk can be minimized or eliminated completely if the Commission can work out a deferred repayment schedule with the affected landowners through one of the two previously mentioned State funds. Because of the State's financial strength and

commitment provided through the Commission, the financing plan can only be viewed as a sound and viable strategy for funding the non-Federal construction responsibilities.

Operation and Maintenance

Commission's Plan for Operation and Maintenance. The Commission's financing plan calls for the project's operation, maintenance, and replacement to be provided through a contract with the White River Regional Irrigation Water District (Irrigation District). As such, the Irrigation District will be responsible for operation, maintenance, and replacement (OM&R) of both the import system and the on-farm features. The expected OM&R costs for these project features are presented in Table 2.

Import System. The bulk of the import system's annual cost is for energy (electricity) to operate the pumping stations and structures (\$2.4 million). These expenditures will be incurred only when there is ample water in the White River available for diversion into the project area and will be proportional to the volume of water imported. The remaining expenditures (\$0.5 million) are for labor and annual upkeep of the import system which will be incurred regardless of whether there is water available for diversion.

On-Farm Features. The on-farm features require annual expenditures of approximately \$724,000 for maintenance of storage reservoirs, tailwater recovery systems, pipelines, and others. The Irrigation District is expected to enter into sub-agreements with individual landowners to operate and maintain these features.

Assessment of Commission's Plan for Operation and Maintenance. The Commission's plan depends upon the Irrigation District's ability to generate the necessary OM&R funds. Currently the Irrigation District has the authority and capability to sell irrigation water. It does not have the authority to tax the project's beneficiaries but has made significant progress in acquiring this authority. The project is expected to provide a mean annual volume of approximately 353,100 acre-feet of irrigation water to the Irrigation District for sale. This volume will vary from year to year depending on the demand within the project area and the availability of an adequate supply in the White River. Table 2 shows an annual OM&R cost of \$8.14 per acre-foot for the import system. On-farm OM&R costs contribute an additional \$2.05 per acre-foot. The total annual OM&R cost per acre-foot is \$10.19 which is approximately one quarter to one third of what an average farmer in the project area is currently paying for energy costs associated with groundwater. Because of this low cost and the lack of alternatives when groundwater is depleted, the Irrigation District should be able to sell all available water provided by the project.

The only risk seen is associated with the annual labor and upkeep expenditures of \$0.5 million, which will be incurred regardless of whether there is any irrigation water available for sale. During the very infrequently times when there is insufficient water in the White River for diversion, it may be difficult for the Irrigation District to meet these obligations. Because of this, the Irrigation District will have to set up a contingency fund from surpluses generated during better years to meet any shortfalls. Discussions with the Irrigation District have indicated a willingness to do so. Additionally, once the Irrigation District has acquired the capability to tax the project beneficiaries,

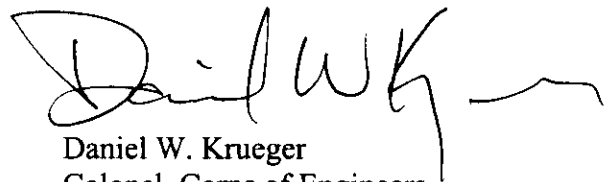
Table 2
Summary of Operation, Maintenance, and Replacement Costs
Grand Prairie Area Demonstration Project
October 1996 Price Levels

Item	Total Cost	Cost per Acre-Foot	Frequency
1. Import System Costs			
Large Pumping Station			
Labor (6 Employees)	202,269	0.57	Annual
Energy (\$0.047/KWH)	2,123,622	6.01	Annual
Demand Charge	560,078	1.59	Annual
Replacement			
Roof	270,135		Every 20 Years
Motor Control Centers	210,725		Every 35 Years
Electric Motor Stator	300,890		Every 35 Years
Pump Impellers	225,670		Every 40 Years
Small Pump Stations			
Labor (4 Employees)	120,000	0.34	Annual
Energy (\$0.047/KWH)	192,808	0.55	Annual
Structures			
Labor (4 Employees)	120,000	0.34	Annual
Energy (\$0.047/KWH)	55,298	0.16	Annual
Channels			
Mowing	33,750	0.10	Three Times per Year
Excavation	40,000		Every 20 Years
Summary of Annual Costs			
Energy (\$0.047/KWH)	2,371,727	6.72	Annual
Labor (14 Employees)	442,269	1.25	Annual
Mowing	33,750	0.10	Annual
Maintenance and Replacement	28,000	0.08	Annual
Total	2,875,746	8.14	
2. On-Farm Costs			
Irrigation Pipe	169,566	0.48	Annual
Pumps and Power Units	175,905	0.50	Annual
Water Control Structures	25,382	0.07	Annual
Reservoirs	309,142	0.88	Annual
Tail Water Recovery	43,842	0.12	Annual
Total	723,836	2.05	Annual

this problem should be eliminated. A minimal tax in the neighborhood of \$2.00 per acre on the 242,000 acre benefited area, along with a minimal contingency fund, should solve any anticipated problems associated with irrigation water shortfalls.

Conclusion

The Commission can confidently meet its construction obligations through the funding sources presented previously. It can also be counted on to properly maintain the project using the White River Regional Irrigation Water Distribution District. I find it reasonable to expect that adequate resources will be available to satisfy all of the non-Federal financial obligations for the project.

A handwritten signature in black ink, appearing to read 'Daniel W. Krueger', followed by a horizontal line.

Daniel W. Krueger
Colonel, Corps of Engineers
Commanding



Arkansas Soil and Water Conservation Commission

J. Randy Young, P.E.
Executive Director

101 EAST CAPITOL
SUITE 350
LITTLE ROCK, ARKANSAS 72201

PHONE 501-682-1611
FAX 501-682-3991

July 27, 1999

Colonel Daniel W. Krueger
District Engineer
U.S. Army Engineer District, Memphis
167 North Main Street, B-202
Memphis, TN 38102-1894

Dear Colonel Krueger:

The Arkansas Soil and Water Conservation Commission (the "Commission") will act as the non-Federal sponsor of the Grand Prairie Area Demonstration Project (the "Project") and is capable of meeting the cost sharing obligations required under the terms of the draft Project Cooperation Agreement (the "PCA"). The Commission also possesses sufficient authority and legal capability to perform all of the terms of the PCA.

With regard to our statement of Financial Capability, the Commission will provide the \$111 million of non-Federal construction funding. The sources of the funds will include any or all of the following: (1) the Arkansas Water Development Fund, (2) the Arkansas Water Resources Cost Share Revolving Fund, and (3) proceeds from the sale of the Arkansas Water, Waste Disposal and Pollution Abatement Facilities General Obligation Bonds. The funds available will be more than sufficient to fund our obligations presented in Table 1 (provided by the Memphis District Corps of Engineers). It should be noted that the Arkansas Constitution prohibits the commitment of funds that have not been appropriated by the Arkansas General Assembly and may impair the Commission's ability to provide funding beyond FY2001.

Table 1 Summary of Non-Federal Construction Costs Grand Prairie Area Demonstration Project (Fully Funded Costs, Includes Estimates for Inflation, \$000)					
Fiscal	Import System			On-Farm	
Year	Cash	LERRD	Total	Features	Total
2000	11,278	4,138	15,416	3,932	19,348
2001	5,765	14,376	20,141	2,345	22,486
2002	20,939	5,984	26,923	9,042	35,965
2003	12,130	2	12,132	7,140	19,272
2004	6,961	0	6,961	4,221	11,182
2005	1,747	0	1,747	1,000	2,747
Total	58,820	24,500	83,320	27,680	111,000

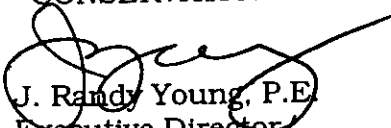
The Commission understands its obligation to operate and maintain this project after its completion. The Commission anticipates contracting operation and maintenance to the White River Regional Irrigation Water District (the "District"). Revenues to meet this obligation will come from fees assessed the project's beneficiaries, including without limitation proceeds from the sale of the approximately 350,000 acre-feet of irrigation water provided annually and levy of assessed benefits within the project improvement area(s) created by the District. An estimate of the project's operation, maintenance, and replacement costs has been furnished by the Memphis District (Table 2). It is understood that these costs are based on October 1996 price levels and that they will escalate over the life of the project due to inflation. The annual operation and maintenance costs will be covered by the above annual revenues and a reserve fund will be established to provide for periodic maintenance and replacements.

Table 2 Operation, Maintenance, and Replacement Costs Grand Prairie Area Demonstration Project (October 1996 Price Levels, \$000)		
Item	Cost	Frequency
Annual Expenditures		
Large Pumping Station	2,886	
Small Pump Stations	313	
Structures	175	
Channels	102	
On-Farm	724	
Total		
Periodic Maintenance and Replacement		
Large Pumping Station		
Roof	270	Every 20 Years
Motor Control Centers	211	Every 35 Years
Electric Motor Stator	301	Every 35 Years
Pump Impellers	226	Every 40 Years
Channels	40	Every 20 Years

The Commission is keenly aware of the critical ground water problems in the State's Grand Prairie region. This Project will make significant strides in resolving the problem. If you have any questions regarding the above, please contact Earl Smith, Mark Bennett or me.

Sincerely,

ARKANSAS SOIL & WATER
CONSERVATION COMMISSION


J. Randy Young, P.E.
Executive Director/
Ex-Officio Secretary

JRY:AMB:slc

cc: Governor Mike Huckabee
Members of the ASWCC
White River RIWD

WHITE RIVER



IRRIGATION
DISTRICT

Colonel Daniel W. Krueger
U.S. Army Corps of Engineers
Memphis District
167 North Main Street B-202
Memphis, Tennessee 38103-1894

October 8, 1999

Dear Colonel Krueger,

The White River Regional Irrigation Water Distribution District would like to state their strong support of the Grand Prairie Area Demonstration Project. We have expended much time, effort, and money to position ourselves to meet the non-Federal obligations.

We have continuously coordinated with the Memphis District, as well as the Arkansas Soil and Water Conservation Commission, and want to insure that the local responsibilities will be carried out as outlined in the Project Cooperation Agreement. While the Arkansas Soil and Water Conservation Commission has provided a letter of intent to act as the project sponsor, the White River Irrigation District intends to continue in their efforts to form the necessary legal entity to be a legally and financially capable sponsor of the project. We are pleased to be included as a signer of the Project Cooperation Agreement and fully intend to be prepared to carry out the construction, operation and maintenance requirements of the local sponsor.

We have made significant progress in becoming financially capable of implementing this much needed project and are eager to move quickly to construction. All necessary commitments will be finalized before execution of the PCA.

Sincerely,


Tommy Hillman
President

TH:lhd



United States
Department of
Agriculture

Room 3416, Federal Building
700 West Capitol Avenue
Little Rock, Arkansas 72201

SEP 21 1999

Colonel Dan Krueger
U.S. Army Corps of Engineers
Memphis District
167 North Main Street, B-202
Memphis, Tennessee 38103-1894

Dear Colonel Krueger:

This letter is in response to our staffs discussions on future Natural Resources Conservation Service (NRCS) participation in the Grand Prairie Area Demonstration Project.

NRCS has participated as partners in the plan development and analyses on this project as a part of the Eastern Arkansas Regional Comprehensive Study. NRCS has participated in all phases of plan formulation, development, analyses and report preparation, and has reviewed the completed General Reevaluation of the Grand Prairie Area. I am proud of the partnership that has developed between NRCS and the Corps of Engineers (COE). NRCS strongly supports implementation of the recommended alternative and believes that it is the best means of preserving both the Sparta and alluvial aquifers and protecting the economic base of the Grand Prairie Area while providing significant environmental benefits. I see significant national benefits, both economic and environmental, in implementing the recommended alternative.

NRCS routinely implements on-farm type features and has the necessary authorities, expertise, experience, and resources for implementing the on-farm features of the Grand Prairie Project. NRCS is willing to act as construction agent for the on-farm features of the project, pending negotiation of a Memorandum of Agreement (MOA) on procedures and provisions of necessary funding. Our staffs have been working to develop the MOA and on developing the necessary long-term contracts and maintenance agreements necessary for successful implementation while protecting the Federal investment.

I look forward to continuing to work with the Memphis District on this project. Please feel free to contact me at (501) 301-3100 if you have questions concerning this or other matters.

Sincerely,



KALVEN L. TRICE
State Conservationist

**EASTERN ARKANSAS REGION
COMPREHENSIVE STUDY**

**GRAND PRAIRIE AREA
DEMONSTRATION PROJECT**

**FINAL ENVIRONMENTAL
IMPACT STATEMENT**

SEPTEMBER 1999

FINAL ENVIRONMENTAL IMPACT STATEMENT
Proposed Plan for Water Conservation, Groundwater Management,
and Irrigation Water Supply in the Grand Prairie, Arkansas
Prairie, Arkansas, Monroe, and Lonoke Counties

The responsible lead agency is the Memphis District Corps of Engineers. The responsible cooperating agency is the Natural Resources Conservation Service.

ABSTRACT:

The Grand Prairie project area is located in eastern Arkansas and includes significant portions of Arkansas and Prairie counties and small portions of Monroe and Lonoke counties. The Memphis District and the Natural Resources Conservation Service, as a cooperating agency, have investigated water conservation measures; groundwater management strategies; irrigation water supply; and fish and wildlife, recreation, and environmental protection/restoration measures that could potentially be implemented within the project area. Four alternative plans were investigated in detail and are presented as the final array of alternatives. All plans incorporate water conservation measures and additional water storage with an irrigation water import system, and all plans involve restoring native prairie vegetation and providing additional waterfowl foraging habitat. However, each alternative plan contains a different import system. Direct construction impacts are essentially the same for all plans, but impacts and benefits to aquatic resources vary slightly. Also, economic costs and benefits vary with each plan. This final environmental impact statement evaluates the effects each plan has on the study areas's significant resources. The selected plan is also the National Economic Development (NED) Plan and includes a 1,640 CFS import system to divert excess flows from the White River, 8,849 acres of new on-farm irrigation reservoirs, on-farm tail-water recovery systems, restoration of prairie vegetation, and the annual flooding of 38,529 acres of harvested rice fields (on an average annual basis) for waterfowl. To compensate for impacts associated with construction of the import system, 193 acres of cleared land would be acquired in fee title and planted in upland hardwood trees; and 243 acres of agricultural land would be acquired in fee title and planted in bottomland hardwood trees. The estimated cost of the selected plan, including mitigation, is \$270,512,000; it has a benefit/cost ratio of 1.2.

If you would like further information on this statement, please contact:

Mr. Edward P. Lambert
U.S. Army Engineer District, Memphis
Environmental and Economics Branch
167 North Main Street, B-202
Memphis, Tennessee 38103-1894
Telephone: (901)544-0707 or
1-800-317-4156, ext. 0707

NOTE: Information, displays, maps, etc., discussed in the Main Report and appendices are incorporated by reference in the Final Environmental Impact Statement.

1. SUMMARY

Major Conclusions and Findings

1.1 Depletion of the alluvial aquifer in eastern Arkansas, due to extensive agricultural use, prompted the U.S. House of Representatives, Committee on Public Works and Transportation, to adopt a resolution in September 1982 authorizing the Memphis District Corps of Engineers to examine the feasibility of agricultural water supply and conservation improvements in the region. The Eastern Arkansas Region Comprehensive Study area comprised 25% (13,400 square miles) of the state land area and included all or portions of 24 counties in eastern Arkansas. The reconnaissance phase study initiated in October 1983 and the subsequent report completed in March 1985 indicated that several agricultural water supply and conservation plans appeared to be suitable. A feasibility study started in September 1985 and culminated with a draft report that indicated feasible agricultural water supply and conservation plans for five separate agricultural areas: the Grand Prairie, Little Red River, Black River, White River, and Bayou Meto areas. However, the feasibility study was terminated at this stage because Corps policy does not consider agricultural water supply a high-priority output.

1.2 Congress directed the Corps, through Energy and Water Development Appropriations Acts, to select and develop implementation plans for one area to serve as an agricultural water supply demonstration project. The Grand Prairie was selected because alluvial aquifer depletion is comparably more severe within this area. The reevaluation report and this final environmental impact statement present the findings of a complete reevaluation of the problems and needs of the Grand Prairie project area as they currently exist. Findings on Executive Order 11988, Executive Order 11990, Executive Order 12898, ER 1165-2-132, and the Section 404 evaluation are presented in the following paragraphs along with the rationale for designation of the national economic development (NED) plan and the selected plan. This section also includes project construction and real estate information.

RATIONALE FOR DESIGNATION OF NED PLAN

1.3 The NED plan is defined as the plan that reasonably maximizes beneficial contributions to the national economic development. In order to determine which alternative would yield the greatest net economic benefits, each alternative plan was subjected to economic optimization. Alternative 7B would provide maximum excess benefits. The estimated cost of this plan, including mitigation, is \$270,512,000; it has a benefit/cost ratio of 1.2.

RATIONALE FOR DESIGNATION OF SELECTED PLAN

1.4 Alternative 7B was chosen as the selected plan because it maximizes net economic benefits and it is the NED plan. This plan provides annual net benefits of \$6,876,000, and it has a

benefit/cost ratio of 1.2 to 1. Furthermore, it meets the study objectives and satisfies many of the project area's problems and needs. It minimizes groundwater depletion and maximizes water conservation efficiency. It also provides additional waterfowl habitat, benefits to tributary stream fisheries, and an opportunity to increase substantially the amount of tallgrass prairie within the region.

CONSTRUCTION

1.5 The construction phasing is presented in Volume 1, Main Report, Page 90. This section describes how the project construction will be accomplished. A more detailed schedule is provided in the Project Management Plan. The White River Regional Irrigation Water Distribution District (WRIWDD), local sponsor, would be required to provide the project relocations. During approximately the first four years of the six-year construction period, plans and specifications would be prepared for the 14 construction items. The initial phase of the plans and specifications would be to prepare detailed rights-of-way maps including the relocations necessary for project construction. The sponsor would coordinate with the owner of the facility to accomplish the relocation. Funds are included in the project costs estimates for these relocations. Page 76 of the Main Report discusses the relocations. Currently, bridge relocations are planned at 34 sites and utility relocations at 342 sites. Relocations would be accomplished to minimize interruptions and to provide alternate access where possible. Culverts at road crossings accomplished during construction would be coordinated with the state and local governments and highway departments to minimize traffic interruptions. Alternate access would be provided during construction where feasible.

1.6 A stormwater pollution prevention plan (SWPPP) would be prepared in compliance with U.S. Environmental Protection Agency and State of Arkansas regulations. A notice of intent would be filed with the State of Arkansas to obtain stormwater permits. The SWPPP would outline temporary erosion control measures such as silt fences, retention ponds, and dikes. The construction contract would include permanent erosion control measures such as turfing and placement of riprap and filter material.

1.7 At completion of the right-of-way (ROW) map for each item of construction, the mitigation necessary for that item of work would be included in the ROW request made to the sponsor. The sponsor must provide all necessary ROW for each item before construction can be initiated.

REAL ESTATE ACQUISITION

1.8 The Grand Prairie Area Demonstration Project is a cost-shared undertaking between the U.S. Army Corps of Engineers and WRIWDD, non-federal sponsor. Under terms of the Project Cooperation Agreement (PCA) to be signed by the both the Corps and the sponsor, the sponsor would be responsible for acquiring all lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) for the project.

1.9 The sponsor has both the ability and the financial capability to acquire the LERRDs for this project. The sponsor is a political subdivision of the State of Arkansas and will have the power of eminent domain to acquire the right-of-way (ROW) for this project through condemnation if purchase of ROW cannot be made through negotiation. The sponsor has indicated to the Corps that they anticipate having “quick-take” (condemnation) authority for land acquisition at the time the PCA is to be signed. Quick-take authority allows the sponsor to obtain all the non-federally owned right-of-way for this project through either negotiated purchase or condemnation as required.

1.10 ROW for this project would be obtained through use of fee purchase or easement estates. The following easement estates would be utilized in this project: restrictive channel improvement, water pipeline, road easement, restricted access road easement, and temporary construction easement. Publicly owned real estate would be acquired through negotiated purchase or use of permits or licenses, or other instruments as needed.

1.11 The sponsor must comply with the requirements of Public Law 91-646, as amended, since they would acquire all the ROW needed for project construction. The sponsor is aware of their obligation under PL 91-646. The Corps would provide the sponsor with any assistance needed concerning acquisition of ROW for this project.

SECTION 404 FINDINGS

1.12 The project features of the selected plan have been evaluated with respect to Section 404(b)(1) Guidelines for Specifications of Disposal Sites for Dredged or Fill Material, published by the U. S. Environmental Protection Agency. These evaluations are included in Appendix C, Section IV. The potential for environmental impact of each disposal activity was estimated on the basis of currently available engineering design data and the pertinent physical, chemical, and biological information that have been compiled as a result of this and other studies. Efforts were made to identify the least environmentally damaging practical alternative for each disposal site, wherever such alternatives were available.

1.13 No particular violations of applicable State of Arkansas water quality standards, other than for turbidity during construction operations were found. Construction methods would be employed to minimize the possibility of violating the Toxic Effluent Standards of Section 307 of the Clean Water Act. None of the proposed plans would harm any threatened or endangered species or their critical habitat.

1.14 It was found that the proposed material discharges would not cause or contribute to significant adverse effects on human health; the life stages of organisms within the aquatic ecosystem; or ecosystem diversity, productivity, and stability. Also, no significant impacts were identified on recreational, aesthetic, or economic values. Some of these evaluations will be refined and updated when more site-specific water, sediment, and disposal area physical and chemical data become available. In the interim, the proposed dredged material disposal sites are found to be in compliance with the current Section 404 guidelines.

FINDINGS ON EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

1.15 Portions of the proposed project would be constructed in floodplains. All non-floodplain alternatives were dropped during screening because they were not economically justified. Section 6 describes the beneficial and adverse impacts of each alternative in the final array and describes any expected losses of natural floodplain benefits. Views of the general public have been obtained at numerous meetings. All alternatives were designed to minimize, to the extent practical, adverse impacts to floodplains. The selected plan is responsive to the planning objectives and is consistent with the requirements of Executive Order 11988.

FINDINGS ON EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

1.16 One of the major project planning objectives was to maintain the long range productivity of wetlands and forests. Although efforts were made to minimize impacts to wetlands, there were no practical alternatives to locating some project features in wetlands. Adverse impacts to wetlands are discussed in Section 6. Alternative 7B, selected plan, is responsive to the planning objectives established for the study; and it is also consistent with the requirements of Executive Order 11990.

FINDINGS ON EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE IN MINORITY AND LOW-INCOME POPULATIONS

1.17 Project construction is not expected to have adverse environmental or health effects on minority or low-income populations. The economic effects of the project on minorities are all expected to be positive and primarily secondary or indirect. Employment and income levels of minorities would probably be increased slightly during project construction. The project would prevent future increased unemployment of minorities and low-income residents by maintaining irrigated agricultural practices. The project's effects on the general population's health, social, and economic status are addressed in this final environmental impact statement as well as the Systems of Accounts table in the Main Report.

FINDINGS ON ER 1165-2-132, HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

1.18 Engineering Regulation 1165-2-132, Water Resources Policies and Authorities for Hazardous, Toxic, and Radioactive Waste for Civil Works Projects, requires the performance of a hazardous, toxic, and radioactive waste (HTRW) assessment(s) to determine the potential for encountering any HTRW at or near Corps civil works projects.

1.19 A Phase 1 Assessment was conducted to determine the potential for HTRW occurring within the project-affected area. Site inspections, aerial videotape and photography review, document research, and coordination with appropriate agencies were performed in conducting this assessment. Based on these investigations, it was concluded that it was improbable that any HTRW exists within the project impact zone and that it was unlikely that any HTRW would be impacted by project construction or operation. No additional HTRW investigations are required unless new information

is revealed to indicate otherwise. The complete HTRW Phase 1 Assessment is contained in Appendix C, Section IX.

Areas of Controversy

1.20 The major environmental and economic concerns raised during this study were related to potential impacts on (1) aquatic resources (both in the White River and smaller tributary streams), (2) floodplain wetlands along the White River, and (3) navigation. Resource agencies and public and private interests expressed their concerns regarding these matters at numerous meetings. Therefore, it was extremely important to adequately evaluate and document the environmental and economic impacts associated with the project.

Unresolved Issues

1.21 The Arkansas Game and Fish Commission (AGFC) and the U.S. Fish and Wildlife Service (USFWS) have expressed concerns that the project as designed would not provide sufficient recreational opportunities to the general public. Although they support the project feature to flood additional cropland acreage for waterfowl on private lands, they have noted that the general public would not have access to hunt waterfowl on these lands. They have encouraged the Memphis District and the White River Regional Irrigation Water Distribution District (local sponsor) to either guarantee public hunting access on some of these lands or acquire and manage additional waterfowl areas specifically for the general public. The AGFC and USFWS would also like the project to furnish public fishing access to the new irrigation canals. The local sponsor has agreed to provide recreational access to project lands where they have sufficient interests and where public safety is not a concern.

1.22 Also, these agencies as well as the Arkansas Natural Heritage Commission are concerned about the heights of some proposed weirs. One hundred twenty weirs would be constructed in existing tributary streams as part of this project. The elevational differences between the tops of some weirs and the respective channel top banks is as little as one foot. This has raised questions as to whether the pooled water in these streams could alter the hydrology of riparian plant communities. The natural resources agencies have suggested additional investigations to determine if plant communities could be adversely impacted by any of these weirs. These investigations would be performed in cooperation with appropriate state and federal agencies; and, if necessary, weirs would be relocated or redesigned in order to avoid or minimize adverse impacts to sensitive riparian plant communities. Weirs would be installed in 13 of 14 construction reaches. Weir investigations and any subsequent design modifications or relocations would be made prior to the onset of construction in each individual reach. Weir investigations would be conducted over the next four years.

Relationship of Plans to Environmental Requirements

1.23 Table 1-1 indicates the relationship and compliance status of each plan alternative with federal environmental protection statutes and appropriate executive orders and memoranda. It also describes the necessary action required to comply with the statute, executive order, or executive memorandum in question.

TABLE 1-1
RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
GRAND PRAIRIE AREA DEMONSTRATION PROJECT

<u>FEDERAL STATUTES</u>	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>	<u>PLAN D</u>
1. <u>Archaeological and Historic Preservation Act of 1974.</u> Compliance requires Corps to undertake recovery, protection, and preservation of significant cultural resources whenever its activities may cause irreparable loss or destruction of such resources. Coordination of FEIS will bring project into full compliance.	FC	FC	FC	FC
2. <u>Clean Air Act, as Amended.</u> Compliance requires coordination with the U.S. Environmental Protection Agency and analysis of potential impacts on air quality. Coordination of FEIS will bring project into full compliance.	FC	FC	FC	FC
3. <u>Clean Water Act of 1977.</u> Compliance requires preparation of 404(b)(1) Evaluation and submission of such to Congress with the FEIS or procurement of state water quality certification. See Appendix C, Section IV, for the 404(b)(1) evaluation.	FC	FC	FC	FC
4. <u>Endangered Species Act of 1973, as Amended.</u> Compliance requires coordination with the U.S. Fish and Wildlife Service (USFWS) to determine if any endangered or threatened species or their critical habitat would be impacted by the project.	PC	PC	PC	PC
5. <u>Federal Water Project Recreation Act.</u> Compliance requires review by the Department of the Interior. Washington level review of the FEIS will bring the project into full compliance.	PC	PC	PC	PC
6. <u>Fish and Wildlife Coordination Act.</u> Compliance requires coordination with the USFWS and the Arkansas Game and Fish Commission. Agency comments and recommendations are discussed in Appendix C, Section VI, Part A, which includes the Fish and Wildlife Coordination Act Report.	FC	FC	FC	FC

TABLE 1-1 (cont.)
RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
GRAND PRAIRIE AREA DEMONSTRATION PROJECT

<u>FEDERAL STATUTES</u>	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>	<u>PLAN D</u>
7. <u>Land and Water Conservation Fund Act.</u> Compliance requires Secretary of the Interior approval of replacement property that would be acquired to mitigate converted Ark. Natural Heritage Comm. property purchased with LWCFA funds.	PC	PC	PC	PC
8. <u>National Historic Preservation Act.</u> Compliance requires Corps to take into account the impacts of project on any property included in or eligible for inclusion in the National Register of Historic Places.	FC	FC	FC	FC
9. <u>National Environmental Policy Act.</u> Compliance requires preparation of this document. Processing of the final EIS and signing of the Record of Decision will bring this project into full compliance.	PC	PC	PC	PC
10. <u>River and Harbor Act.</u> No requirements for Corps projects authorized by Congress.	NA	NA	NA	NA
11. <u>Farmland Protection Policy Act.</u> Compliance requires coordination with the Natural Resources Conservation Service to determine if any designated prime or unique farmlands are affected by the project.	FC	FC	FC	FC
12. <u>Watershed Protection and Flood Prevention Act.</u> No requirements for Corps projects.	NA	NA	NA	NA
13. <u>Wild and Scenic River Act.</u> Compliance requires coordination with Department of the Interior to determine if any designated or potential wild, scenic, or recreational rivers are affected by the project. Coordination has been accomplished and there are no such rivers in the project area.	NA	NA	NA	NA

TABLE 1-1 (cont.)
RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
GRAND PRAIRIE AREA DEMONSTRATION PROJECT

<u>EXECUTIVE ORDER/MEMORANDA</u>	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>	<u>PLAN D</u>
1. <u>Executive Order 11988, Floodplain Management.</u> Compliance requires an assessment and evaluation together with the other general implementation procedures to be incorporated into the GRR and EIS.	FC	FC	FC	FC
2. <u>Executive Order 11990, Protection of Wetlands.</u> Compliance requires results of analysis and findings related to wetlands be incorporated into GRR and EIS.	FC	FC	FC	FC
3. <u>Executive Memorandum, Analysis of Impacts on Prime and Unique Farmlands in EIS.</u> Compliance requires inclusion of effects of proposed action on prime and unique farmlands in EIS.	FC	FC	FC	FC
4. <u>Executive Order 11593, Protection and Enhancement of the Cultural Environment.</u> Compliance requires Corps to administer cultural properties under their control in stewardship for future generations; preserve, restore or maintain such for benefit of the people; and assure that its plans contribute to preservation and enhancement of non-federally owned sites.	FC	FC	FC	FC
5. <u>Executive Order 12898, Environmental Justice in Minority and Low-income Populations.</u> Compliance requires assessment of project effects on minority and low-income populations.	FC	FC	FC	FC

FC - In Full Compliance
PC - In Partial Compliance
NA - Not Applicable

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3. NEED FOR AND OBJECTIVES OF ACTIONS

3.1 Heavy agricultural use has severely depleted the alluvial aquifer in the Grand Prairie region of eastern Arkansas. Congress, the Corps of Engineers, the Natural Resources Conservation Service (cooperating agency), and the White River Regional Irrigation Water Distribution District (local sponsor) are responding to the need for water conservation, groundwater management strategies, and irrigation water supply in the Grand Prairie.

Project Authority

3.2 This general reevaluation was conducted in response to congressional direction and funding provided by Energy and Water Development Appropriations Acts. It is a continuation of preconstruction, engineering, and design of the Eastern Arkansas Region Comprehensive Study authorized by the Committee on Public Works and Transportation of the U.S. House of Representatives on September 23, 1982. The Grand Prairie-Bayou Meto Project was reauthorized by the Water Resources Development Act of 1996.

Public Concerns

3.3 The continued depletion of the alluvial aquifer and the impact this will have on agriculture and the regional economy has been a major concern prior to and throughout this study. Other economic concerns were related to project costs and potential project impacts to navigation and area residences, farm buildings, and other improvements. Environmental concerns primarily involved potential project impacts to aquatic resources and wetlands.

Planning Objectives

NATIONAL OBJECTIVE

3.4 The Water Resources Council's *Economic and Environmental Principles for Water and Related Land Resources Implementation Studies* states that "The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." Contributions to the national economic development (NED) objective are achieved by increasing the net value (expressed monetary units) of the nation's output of goods and services. Water and related land resource management plans must develop long-range goals and priorities for the study area that are consistent with the NED objective.

PLANNING OBJECTIVES

3.5 After determining the existing and future needs of the project area, a set of planning objectives was established to guide the formulation of alternatives. Planning objectives stem from the national, state, and local water and related land resource management needs. These objectives have been developed through problem analysis and a public involvement program and have provided the basis for formulation of alternatives, impact assessment, and evaluation. The planning objectives are:

1. Protect and preserve the alluvial aquifer.
2. Maximize the use of water conservation.
3. Provide supplemental water supply to meet the irrigation water needs of the Grand Prairie.
4. Restore fish and wildlife habitat.
5. Restore native prairie vegetation.
6. Maintain long-range productivity of wetlands and forests.
7. Minimize cost and maximize outputs.

4. ALTERNATIVES

4.1 This section briefly describes the project alternatives retained for further analysis and the various project alternatives examined and eliminated during the screening process, and it also summarizes the potential environmental impacts associated with each alternative in the final array. For a more detailed description of plan formulation, the screening process, and the final array of alternatives, see the plan formulation section of the Main Report.

Without Condition (No Federal Action)

4.2 Agricultural withdrawals have severely depleted the alluvial aquifer, and an impermeable clay confining layer restricts surface recharge. Historical and current trends, well data, field observations, and groundwater modeling studies all indicate that depletion of the aquifer will continue at an alarming rate. However, it is expected that at some point in the future the State of Arkansas will declare this region a critical groundwater area and begin limiting withdrawals to the annual recharge rate. It is assumed that the amount of irrigation water stored, surface water captured, and irrigation water recovered will remain similar to existing conditions. However, it is estimated that only 26.6% of the currently irrigated cropland will be irrigated by the year 2015 due to continued aquifer depletion.

Plans Considered in Preliminary Analysis

4.3 Numerous structural and nonstructural measures were evaluated in the formulation of plan alternatives. Plan formulation and optimization was initially conducted for a 394,475-acre project area. However, the majority of landowners in the southeastern section of the original project area opted not to participate in the project; this resulted in a 11% (31,813 acres) reduction in the size of the project area. Since plan formulation and optimizations of project measures were initially performed for the original project area, alternatives associated with the original project area are denoted with an "A"; and alternatives designed specifically for the new 362,662-acre project area are denoted with a "B."

4.4 Alternative 1 is simply the No Action alternative or the future without-project condition discussed above. Alternatives 2A and 2B involved construction of additional irrigation reservoirs without water conservation measures or an irrigation water import system. Alternatives 3A and 3B consisted of various conservation measures and additional irrigation water storage (new reservoirs), but they did not contain an import system; conservation measures were designed to increase efficiency of irrigation water usage from 60% to 70%. The construction of additional irrigation reservoirs was not included in alternatives 4A and 4B, but they combined the conservation features contained in alternatives 3A and 3B with an import system which would have diverted water from

the White River.

4.5 A combination of conservation measures, irrigation water storage, and an import system with an 1,800 cubic feet per second (CFS) pump station were incorporated into alternatives 5A and 5B; these three basic plan components were interrelated and functionally interdependent. Alternative 5A was analyzed for seven different “stop pump” levels, and analyses involving Alternative 5B were based solely on stop pump criteria contained in the 1986 State Water Plan (current state law).

4.6 Alternatives 6A and 6B were comparable to alternatives 5A and 5B, respectively, with the exception that 6A and 6B increased the amount of additional water storage by 25%. Analysis of Alternative 6A was based on the same seven stop pump levels as 5A; and, like 5B, 6B was analyzed for the 1986 State Water Plan only.

4.7 Alternative 7 is basically the same plan as Alternative 5B except that Alternative 7 optimizes the import system. Prior alternatives were used to optimize the on-farm components (i.e., conservation measures, storage) of the project. In order to optimize the import system, on-farm components were held constant and four different import systems were evaluated as separate alternatives. These alternatives are identified as 7A (1,480 CFS import system), 7B (1,640 CFS import system), 7C (1,800 CFS), and 7D (1,900 CFS import system).

Plans Eliminated From Further Study

4.8 Of all the alternative plans considered in preliminary analyses, only the four variations of alternative 7 and the No Action alternative (future without-project condition) were selected for detailed analyses in the final array of alternatives.

4.9 Alternative 2 (storage only) was dropped from further analysis because it was determined that farmers were already capturing as much of the available surface water runoff as physically possible. Constructing additional reservoirs would prevent existing reservoirs from being filled to capacity and would increase evaporation and infiltration losses.

4.10 Detailed economic analyses were performed on Alternative 3A. The results revealed that Alternative 3A was not the economic optimum plan (NED plan). Therefore, alternatives 3A and 3B are not presented in the final array of alternatives.

4.11 Studies conducted by the Natural Resources Conservation Service (NRCS) revealed that conservation efficiencies could not be achieved without building additional storage reservoirs; therefore, Alternative 4 (import system and conservation without additional storage) was eliminated from further study.

4.12 Alternatives 5A and 5B are not presented in the final array of alternatives. Alternative 5A

was dropped because it was designed for the original 394,475-acre project area. Alternative 5B was eliminated because Alternative 7 is basically the same plan; however, Alternative 7 evaluates four different import systems instead of just one.

4.13 A comparison of alternatives 5A and 6A established that increased levels of irrigation water storage above the optimum level identified by the NRCS were not economically justified. Therefore, Alternatives 6A and 6B were eliminated from further study.

Plans Considered in Detail

4.14 The resulting plans are the final array of alternatives. These alternatives, all variations of Alternative 7, are described in the paragraphs which follow.

ALTERNATIVE 7 (Import System Optimization)

4.15 This plan combines the conservation measures contained in Alternative 3 with 88,493 acre-feet of additional water storage and an irrigation water import system. Alternative 7 consists of a major pump station and an elaborate water distribution system which utilizes approximately 291 miles of existing streams and channels, 184 miles of new canals, and 177 miles of new pipelines to transfer excess surface water from the White River to the project area. One hundred twenty weirs would be built in existing streams, and numerous other hydraulic structures (e.g., gated check structures, wasteways, culverts, siphons, turnouts, bridges) would be constructed in association with the water delivery system. Appendix B, Volume 3, Section I, provides a detailed description of the pump station and delivery system (including all associated hydraulic structures). Water conservation measures, groundwater management strategies, retrofit of existing farm irrigation systems, and new on-farm irrigation reservoirs are all integral plan components. It is assumed that all new irrigation reservoirs would be built on agricultural land; approximately 8,849 acres of farmland would be lost to reservoirs.

4.16 Since this region once contained a vast tallgrass prairie, native prairie grasses (i.e., big bluestem, little bluestem, Indiangrass, switchgrass) and possibly some prairie forbs would be planted within the rights-of-way of the proposed irrigation canals. The potential planting area within these rights-of-way totals approximately 3,000 acres, affording an opportunity to increase substantially the amount of prairie with the project area. Professional opinion (Thomas L. Foti, Arkansas Natural Heritage Commission, pers. comm.; Lance Tharel, Plant Materials Center, NRCS, pers. comm.) is that prairie grasses could be established at a cost approximately equal to or not substantially greater than the cost for establishing bermuda. However, it must be pointed out that prairie restoration can be costly and time consuming. Therefore, experimental plantings of the prairie grasses are being conducted in order to determine the appropriate planting methodology and associated costs. Results of this experimentation would be used to ascertain the actual acreage planted in prairie grasses.

4.17 Under the auspices of the North American Waterfowl Management Plan (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986), additional cropland acreage would be managed for waterfowl within the project area. Flooding additional cropland for waterfowl foraging habitat has been identified as critical in meeting habitat requirements of waterfowl in Arkansas (Yaich et al. 1990) as well as the entire Lower Mississippi Valley (Loesch et al. 1994).

4.18 The White River cannot support unlimited withdrawals due to low flows and the institutional constraints of current state law that was enacted to protect all users and the environment. Because of these constraints, four different import systems were evaluated for economic optimization. On-farm components of Alternative 7 were held constant; irrigation water usage efficiency was maintained at 70% and storage level was held constant at 88,490 acre-feet (8,949 acres of new reservoirs). Only the import system was varied. The following alternatives were analyzed according to withdrawal limits set forth in the 1986 State Water Plan.

Alternative 7B (1,640 CFS Import System) - Selected Plan

4.19 Diversions from the White River would provide an average of 243,900 additional acre-feet of irrigation water annually. River diversions combined with groundwater withdrawals and conservation practices would initially meet the annual irrigation demand of 481,195 acre-feet. However, there would be an unmet need of 59,791 acre-feet at year 2015 and beyond; beginning in year 2015, annual aquifer withdrawals would be limited to the long-term sustained yield (35,574 acre-feet) which would allow recharge. Still, at year 2015 and subsequent years, this plan would supply 87.6% of the irrigation demand and provide 312,642 acre-feet more water than would be available under future without-project conditions.

Alternative 7A (1,480 CFS Import System)

4.20 Alternative 7A would furnish an average of 235,360 acre-feet of import water annually from the White River. Import water combined with conservation measures and groundwater withdrawals would meet irrigation demands initially. By the year 2015, there would be an irrigation water shortage of 68,331 acre-feet. However, at year 2015, this plan would provide 304,102 acre-feet more water than would be available under future without-project conditions. At year 2015 and afterwards, Alternative 7A would meet 85.8% of the irrigation demand.

Alternative 7C (1,800 CFS Import System)

4.21 This plan would divert an average of 250,227 acre-feet of water annually from the White River. Like alternatives 7B and 7A, this plan would not meet 100% of the irrigation demand by year 2015. At 2015 and beyond, Alternative 7C would supply 88.9% of the demand, a shortage of 53,464 acre-feet. It would still furnish 318,969 acre-feet more water at year 2015 than would be available under future without-project conditions.

Alternative 7D (1,960 CFS Import System)

4.22 This alternative would obtain an average of 256,368 acre-feet of water from the river. It would meet 90.2% of the annual irrigation demand, more than any other alternative, at year 2015. There would be a shortfall of 47,323 acre-feet; it would supply 325,110 acre-feet more water than future without-project conditions.

Comparative Impacts of Alternatives

4.23 Table 4-1 compares the base and without-project conditions and lists the impacts of each detailed plan on the significant resources of the project-affected area. Plan economic characteristics are also compared. The significant resources are individually described in Section 5 of this final environmental impact statement, and the impacts of each alternative plan on each significant resource are detailed in Section 6.

TABLE 4-1
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Rivers and Streams</u>
Base	The study area portion of the White River extends 69.6 miles, from I-40 downstream to St. Charles. There are numerous smaller tributary streams in the project area; many of these streams are intermittent, particularly during summers, due to their relatively small size and high water withdrawal rates.
Future W/O Project	Additional irrigation water may be taken from the White River; but the need for large, expensive pumps to lift the water to the top of the bluffs makes this unlikely. The smaller project area streams will continue to be adversely impacted by agricultural activities.
Alternative 7B - Selected Plan	Maximum stage reductions of about one foot or less would occur on the White River during summer/early fall when the river is low and irrigation demands are highest; changes in stage are almost immeasurable during high flows. Supplemental water would be provided to the tributary streams, and weirs would maintain irrigation pools within these streams.
Alternative 7A	Impacts to the White River would be similar to Alternative 7B. Impacts to the river would vary slightly among plans; but the hydrologic differences among them are minor, and the general trend is the same. Impacts to the tributary streams are also very similar.
Alternative 7C	Impacts would be similar to Alternative 7B.
Alternative 7D	Impacts would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Groundwater</u>
Base	The alluvial aquifer is the principle source of agricultural water; over 90% of all groundwater use is attributed to agriculture. Approximately 96% of the agricultural use is for crop irrigation and 4% is for aquaculture. The heavy agricultural demand has severely depleted the aquifer.
Future W/O Project	It is estimated that groundwater reserves will be totally exhausted by the year 2015 unless withdrawals are regulated. Presently, 408,007 acre-feet of water is being extracted annually from the aquifer.
Alternative 7B - Selected Plan	This plan would provide an additional source of irrigation water. At year 2015 and beyond, annual aquifer withdrawals would be limited to the long-term sustained yield (35,574 acre-feet) which would allow the aquifer to recharge.
Alternative 7A	Impacts would be similar to Alternative 7B.
Alternative 7C	Impacts would be similar to Alternative 7B.
Alternative 7D	Impacts would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Water Quality</u>
Base	Average sediment concentration levels in the White River are 74 mg/l. In comparison to historic data, there are no significant differences in Ph, hardness, or temperature for tributary streams and the White River. Dissolved solid values for tributaries and the White River are below the EPA criterion. Suspended solid levels for the tributaries and the river are about the same.
Future W/O Project	No significant changes are expected.
Alternative 7B - Selected Plan	This plan should not induce any significant sedimentation in tributary streams. The use of White River water for irrigation purposes should have positive effects on farmland and tributaries.
Alternative 7A	Effects on water quality would be similar to Alternative 7B.
Alternative 7C	Effects on water quality would be similar to Alternative 7B.
Alternative 7D	Effects on water quality would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Aquatic Resources</u>
Base	The White River and adjacent oxbow lakes contain valuable commercial and sport fisheries. Fisheries of the smaller tributary streams have been heavily degraded by agricultural activities. Species diversity and abundance of mussels in the White River is relatively high. However, mussels are not plentiful in the tributary streams; channel modification, agricultural runoff, and irrigation withdrawals have been attributed as limiting factors.
Future W/O Project	The White River fishery is expected to remain relatively stable. Native mussel populations in the river should remain similar to existing conditions unless the zebra mussel population proliferates; if zebra mussels increase significantly in abundance, native mussels would be adversely impacted. Fish and mussel populations in the smaller tributary streams should remain similar to existing conditions.
Alternative 7B - Selected Plan	Impacts to the White River fishery as a result of pump entrainment and reductions in surface water elevations are projected to be relatively minor. Benefits to tributary stream fisheries would be substantial (4,328 HUs/month gained), and new irrigation canals would provide 8,560 HUs/month. The minor changes in river surface water elevations should not impact mussels. Overall, mussels in the tributary streams should benefit from this plan.
Alternative 7A	Impacts would be similar to Alternative 7B.
Alternative 7C	Impacts would be similar to Alternative 7B.
Alternative 7D	Impacts would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Bottomland Hardwood Forest</u>
Base	The project area contains approximately 19,931 acres of bottomland hardwood forest (this includes 4,071 acres of forested swamp).
Future W/O Project	The acreage of bottomland hardwoods is expected to increase due to probable cleared land acquisitions and reforestation by Wattensaw WMA and two federal refuges. However, the hydrology of bottomland hardwoods along the White River could be adversely impacted by groundwater depletion.
Alternative 7B - Selected Plan	Approximately 71 acres would be directly impacted by project construction; 31 acres would be lost to project features, and 40 acres would be cleared but allowed to regenerate. 243 acres of cleared agricultural wetlands would be acquired and planted in bottomland hardwood trees to mitigate losses to bottomland hardwood forest and other wetland habitat types. It is unlikely that water withdrawals associated with this plan could adversely impact bottomland hardwoods along the White River. Furthermore, Alternative 7B could prevent or slow desiccation of bottomland hardwoods along the White River that are influenced by groundwater.
Alternative 7A	Construction impacts and corresponding mitigation would be the same as Alternative 7B; project effects on bottomland hardwoods along the White River would be similar.
Alternative 7C	Construction impacts and corresponding mitigation would be the same as Alternative 7B; project effects on bottomland hardwoods along the White River would be similar.
Alternative 7D	Construction impacts and corresponding mitigation would be the same as Alternative 7B; project effects on bottomland hardwoods along the White River would be similar.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Upland Hardwood Forest</u>
Base	The project area contains approximately 14,940 acres of upland hardwood forest.
Future W/O Project	No significant impacts to upland hardwoods are anticipated.
Alternative 7B - Selected Plan	Approximately 59 acres would be permanently destroyed, and approximately 65 acres would be temporarily impacted. Of the 65 acres temporarily impacted, 28 acres would be replanted; and 37 acres would be allowed to regenerate naturally. Also, 193 acres of cleared land would be acquired and planted in upland hardwood trees to offset upland hardwood forest losses and associated wildlife habitat losses.
Alternative 7A	Impacts and mitigation would be the same as Alternative 7B.
Alternative 7C	Impacts and mitigation would be the same as Alternative 7B.
Alternative 7D	Impacts and mitigation would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Wetlands</u>
Base	Approximately 15,860 acres of bottomland hardwood forest, 4,071 acres of forested swamp, 6,987 acres of scrub/shrub swamp, 1,370 acres of marsh, and 99 acres of dead timber are found within the project area.
Future W/O Project	The amount of “natural” wetlands could increase if the WMA and the refuges obtain and reestablish dominant vegetation on presently cleared wetlands. Groundwater wetlands along the White River could be impacted by a drying effect caused by continued depletion of the alluvial aquifer.
Alternative 7B - Selected Plan	Project construction would directly impact approximately 121 acres of “natural” wetlands; 64 acres would be impacted permanently and 57 acres would be temporarily impacted by vegetation clearing. In addition, approximately 64 acres of farmed wetlands would be lost to project construction. 243 acres of cleared agricultural wetlands would be planted in bottomland hardwood trees to mitigate wetland losses. It is unlikely that water withdrawals associated with this alternative could adversely impact White River floodplain wetlands. Moreover, desiccation of groundwater wetlands along portions the White River could possibly be halted or slowed by implementing this plan.
Alternative 7A	Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.
Alternative 7C	Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.
Alternative 7D	Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Prairie</u>
Base	Only approximately 650 acres of tallgrass prairie remain.
Future W/O Project	Approximately half of the remaining prairie is under the management of the Arkansas Natural Heritage Commission; the remaining prairie is in private ownership. The future of the privately owned prairie is uncertain.
Alternative 7B - Selected Plan	No more than 4 acres of prairie would be adversely impacted by project construction. Native prairie vegetation would be established in canal rights-of-way; this plan could increase substantially the amount of prairie in the project area.
Alternative 7A	Impacts and benefits would be the same as Alternative 7B.
Alternative 7C	Impacts and benefits would be the same as Alternative 7B.
Alternative 7D	Impacts and benefits would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Wildlife</u>
Base	A variety of wildlife inhabits the study area, including an abundance of migratory and resident waterfowl.
Future W/O Project	No permanent clearing of woodlands is projected; in fact, possible cleared land acquisitions and reforestation by the Wattensaw WMA and two federal refuges could increase the amount of wildlife habitat. However, some wetlands along the White River could become dryer; this would adversely impact wetland dependent wildlife.
Alternative 7B - Selected Plan	Project construction would negatively impact 245 acres of valuable habitat; this would result in a loss of 104 annualized habitat unit values. Habitat losses would be offset by the acquisition and reforestation of 436 acres of cleared land. Flooding 38,529 acres of harvested rice fields on an average annual basis would provide an additional 12,275,949 duck-use-days (DUDs) per year. Drying of wetlands along the river could be halted or slowed, benefiting certain wildlife species.
Alternative 7A	Construction impacts and mitigation would be the same as Alternative 7B; effects on wildlife inhabiting wetlands along the White River would be similar. However, 38,234 acres of harvested rice fields would be flooded on an average annual basis for waterfowl; this would provide an increase of 12,104,554 DUDs.
Alternative 7C	This plan would provide 38,766 acres of flooded, harvested rice fields on an average annual basis; this would furnish an additional 12,413,646 DUDs. Construction impacts and mitigation would be the same as Alternative 7B; effects on wildlife inhabiting wetlands along the White River would be similar.
Alternative 7D	Construction impacts and mitigation would be the same as Alternative 7B; effects on wildlife inhabiting wetlands along the White River would be similar. 39,128 acres of harvested rice fields would be flooded on an average annual basis; this would provide an increase of 12,623,968 DUDs.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>State and Federal Holdings</u>
Base	Approximately 4,875 acres of Wattensaw WMA is located in the northern portion of the project area. Five Arkansas Natural Heritage Commission (ANHC) natural areas, totaling approximately 786 acres, are contained within the project area. Also, the 86-acre Stuttgart National Aquaculture Research Center (SNARC) and the 914-acre Rice Research and Extension Center (RREC) are located about nine miles east of Stuttgart. The majority of lands within the White River and Cache River national wildlife refuges are located within the study area portion of the White River floodplain.
Future W/O Project	Wattensaw WMA and the two NWRs will likely expand. The SNARC, RREC, and ANHC natural areas should remain similar to existing conditions.
Alternative 7B - Selected Plan	This plan would not adversely impact the SNARC or the RREC. However, approximately 30 acres of upland hardwoods in Wattensaw would be directly impacted by project construction; and approximately two acres of the Railroad Prairie Natural Area would be lost to project construction. The federal refuges should not be affected by this plan.
Alternative 7A	Impacts would be similar to Alternative 7B.
Alternative 7C	Impacts would be similar to Alternative 7B.
Alternative 7D	Impacts would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Endangered and Threatened Species</u>
Base	One endangered species, the pink mucket pearly mussel, is known to occur within the study area reach of the White River. Another endangered species, the pallid sturgeon, could possibly occur within this section of the river. The bald eagle, a threatened species, is a transient along the White River.
Future W/O Project	The status of these species is expected to remain similar to existing conditions.
All Alternatives	This plan should not adversely impact any of these species. A separate biological assessment is being prepared for the pink mucket pearly mussel; mussels would be removed from the construction impact zone of the pump station inlet channel and relocated to sites with suitable habitat.
	<u>Recreation</u>
Base	Presently approximately 17,400 acres of harvested cropland is being flooded annually for waterfowl. This provides approximately 13,746 man-days of hunting and \$411,280 in related expenditures.
Future W/O Project	Recreation will probably remain similar to existing conditions.
Alternative 7B - Selected Plan	This plan would annually provide 28,769 man-days of waterfowl hunting and \$860,760 in related expenditures.
Alternative 7A	28,559 man-days of waterfowl hunting and \$854,485 in related expenditures would be furnished annually by this alternative.
Alternative 7C	This plan would annually provide 28,937 man-days of waterfowl hunting and \$865,802 in expenditures.
Alternative 7D	29,195 man-days of waterfowl hunting and \$873,503 in related expenditures would be furnished annually by Alternative 7D.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Agricultural Lands</u>
Base	The project area contains approximately 254,406 acres of farmland. Major crops are rice, soybeans, wheat, grain sorghum, and corn.
Future W/O Project	Crop production will increase as new technologies, crop varieties, and production practices are developed and adopted. However, by the year 2015, farmers will only be able to irrigate 22.6% (53,954 acres) of the currently irrigated cropland.
Alternative 7B - Selected Plan	Construction of the import system and the irrigation reservoirs would result in the loss of 12,644 acres of farmland. At year 2015 and beyond, approximately 88% (209,046 acres) of the currently irrigated cropland would be irrigated. The annual net agricultural benefit would be \$35,659,000.
Alternative 7A	Construction impacts would be the same as Alternative 7B. At year 2015 and beyond, 205,232 acres of cropland would be irrigated; annual net agricultural benefits would be \$34,823,000.
Alternative 7C	Construction impacts would be the same as Alternative 7B. At year 2015 and beyond, 213,837 acres of cropland would be irrigated; annual net agricultural benefits would be \$36,266,000.
Alternative 7D	Construction impacts would be the same as Alternative 7B. At year 2015 and beyond, 217,391 acres of cropland would be irrigated; annual net agricultural benefits would be \$36,844,000.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Navigation</u>
Base	At present, commodity traffic consists of approximately 120,000 tons of receipts and 544,000 tons of shipments valued at \$27,360,000 and \$91,952,000, respectively.
Future W/O Project	Total movements are projected to increase by 98% by the year 2056; this increase represents an economic gain of \$118,270,000.
Alternative 7B - Selected Plan	Project impacts to navigation would result in an average annual loss of \$127,000.
Alternative 7A	Impacts would result in an average annual loss of \$121,000.
Alternative 7C	Impacts would result in an average annual loss of \$132,000.
Alternative 7D	Impacts would result in an average annual loss of \$136,000.
	<u>Cultural Resources</u>
Base	Approximately 11,000 acres were surveyed, and 174 historic and prehistoric sites were found. However, some relatively small portions of the project rights-of-way were not surveyed.
Future W/O Project	No changes to cultural resources is anticipated.
Alternative 7B - Selected Plan	Any unsurveyed portions of the rights-of-way would be surveyed, and sites would be tested for significance. Any significant sites would be avoided during construction or mitigated.
Alternative 7A	Cultural resources requirements would be the same as Alternative 7B.
Alternative 7C	Cultural resources requirements would be the same as Alternative 7B.
Alternative 7D	Cultural resources requirements would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

	<u>Noise</u>
Base	The study area is relatively noise free due to it rural setting. Most existing noise is associated with agricultural and recreational activities.
Future W/O Project	Slight increase in outdoor recreational noise due to probable expansions of Wattensaw WMA and the Cache and White River NWRs. Agricultural noise should remain similar to existing conditions.
Alternative 7B - Selected Plan	There would be an increase in noise during project construction due to equipment operation. Noise would increase at the pump station during pump operation. However, this noise would be confined to the immediate vicinity of the pump station.
Alternative 7A	Impacts similar to Alternative 7B.
Alternative 7C	Impacts similar to Alternative 7B.
Alternative 7D	Impacts similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Air Quality</u>
Base	Air quality is good to above average due to its rural setting and is in attainment for all air quality standards.
Future W/O Project	Air quality is not expected to change.
Alternative 7B - Selected Plan	Machinery emissions and airborne dust would slightly degrade air quality during construction and maintenance. However, project-induced impacts to air quality would be minor and of short duration.
Alternative 7A	Impacts would be the same as Alternative 7B.
Alternative 7C	Impacts would be the same as Alternative 7B.
Alternative 7D	Impacts would be the same as Alternative 7B.
	<u>Aesthetic Value</u>
Base	Aesthetic value of the study area is closely associated with the beauty and diversity of the flora.
Future W/O Project	Aesthetic value of the study area will likely increase due to probable cleared land acquisitions and reforestation by the state WMA and the federal refuges.
Alternative 7B - Selected Plan	Vegetative clearing associated with construction would reduce aesthetic value. Also, project features would alter the appearance of the landscape; however, establishment of native prairie vegetation within canal rights-of-way should offset negative impacts to aesthetics.
Alternative 7A	Impacts would be the same as Alternative 7B.
Alternative 7C	Impacts would be the same as Alternative 7B.
Alternative 7D	Impacts would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Displacement of People</u>
Base	-----
Future W/O Project	Many of the area's residents could be displaced due to loss of jobs associated with a significant reduction of the area's income when the alluvial aquifer can no longer support widespread irrigation practices.
Alternative 7B - Selected Plan	No people would be displaced if this plan implemented. In fact, Alternative 7B could lessen the displacement of the area's residents expected under future without-project conditions. The area's income would be greatly enhanced over the levels expected without the project which would prevent the expected loss of area employment.
Alternative 7A	Effects would be similar to Alternative 7B.
Alternative 7C	Effects would be similar to Alternative 7B.
Alternative 7D	Effects would be similar to Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Community Cohesion</u>
Base	The cultural heritage of the project area is linked directly to a rural way of life based on agriculture. The preservation of lifestyle is based on the continued existence of the small farm and activities which support an agricultural based economy.
Future W/O Project	There would be a gradual conversion of some small farms to larger farm complexes, but the base economy would remain dependent of agriculture.
Alternative 7B - Selected Plan	Concern is present within the project area relative to the project sponsor's plans for taxation to finance its share of the project costs. Some landowners question the need for the project and are opposed to additional taxes. Others are concerned over providing necessary project rights-of-way.
Alternative 7A	Concerns are the same as Alternative 7B.
Alternative 7C	Concerns are the same as Alternative 7B.
Alternative 7D	Concerns are the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Local Government Finance, Tax Revenues, and Property Values</u>
Base	The area of local government finance is concerned with items such as tax base, property values, and tax revenues. Each of these, and other items, are important because they impact the financial condition of local government units. Financial soundness is important because it often determines the level and quality of the necessary public services provided by local governments
Future W/O Project	Under future without-project conditions, there would be a significant decrease in property values on cropland and a corresponding drop in tax revenue as the area's lands can no longer support irrigation practices due to the loss in irrigation capacity of the alluvial aquifer.
Alternative 7B - Selected Plan	This plan would halt or significantly reduce the erosion of property values and tax base expected under future without-project conditions thereby maintaining revenues from taxes to the local government entities.
Alternative 7A	Effects would be the same as Alternative 7B.
Alternative 7C	Effects would be the same as Alternative 7B.
Alternative 7D	Effects would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Displacement of Businesses and Farms</u>
Base	----
Future W/O Project	Under future without-project conditions, many of the area's businesses and farms could be displaced when the area's aquifer can no longer support widespread irrigation practices.
Alternative 7B - Selected Plan	The area's agricultural income would be greatly enhanced over the levels expected without the project which would maintain the profitability of the area's businesses and farms. Alternative 7B would stop any displacement of the area's businesses or farms expected under future without-project conditions.
Alternative 7A	Effects would be the same as Alternative 7B.
Alternative 7C	Effects would be the same as Alternative 7B.
Alternative 7D	Effects would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Public Services and Facilities</u>
Base	The area of public services and facilities is concerned with the ability of local government to provide the basic public services; e.g., education, police protection, and roads and bridges.
Future W/O Project	Under future without-project conditions, the ability to provide such services will be greatly hindered. The area's tax base is expected to be greatly decreased when the alluvial aquifer is depleted causing a sharp drop in property values. This will cause a corresponding drop in tax revenues needed to provide these services.
Alternative 7B - Selected Plan	This plan would prevent the erosion of property values and corresponding decrease in tax base expected under future without-project conditions. This would maintain the area's ability to provide such basic public services as education, police protection, and roads and bridges.
Alternative 7A	Effects would be the same as Alternative 7B.
Alternative 7C	Effects would be the same as Alternative 7B.
Alternative 7D	Effects would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Community and Regional Growth</u>
Base	Growth in the communities within the project area is directly related to agriculture and agriculture related production.
Future W/O Project	Agricultural production is expected to decrease significantly under future without-project conditions when the alluvial aquifer can no longer support irrigation. The drop in production will mean significant declines in the region's economy with an accompanying decrease in urban and rural population.
Alternative 7B - Selected Plan	This alternative would not contribute appreciably to community and regional growth. However, it would prevent the declines expected in the region's economy under future without-project conditions. It would maintain the area's agricultural and agricultural related production, farms and businesses, income, employment, tax base, public services, and urban and rural population necessary to maintain the area's economy at present levels.
Alternative 7A	Effects would be the same as Alternative 7B.
Alternative 7C	Effects would be the same as Alternative 7B.
Alternative 7D	Effects would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternatives</u>	<u>Significant Resources</u>
	<u>Employment</u>
Base	The area's employment is concentrated in trade, manufacturing, and agriculture.
Future W/O Project	Under future without-project conditions, there would be a significant decrease in agriculture and agriculture related employment as a result of the decline in agriculture's profitability and its accompanying reduction in income as the area's aquifer is depleted and irrigation cannot be sustained. There would also be a significant reduction in employment not directly associated with agriculture due to the secondary effects of the loss in agricultural income to the area's economy.
Alternative 7B - Selected Plan	Alternative 7B would prevent the expected declines in agricultural and agricultural related employment along with any decreases in secondary employment expected under future without-project conditions. There would also be some opportunities for new employment associated with project construction, operation, and maintenance.
Alternative 7A	Effects would be the same as Alternative 7B.
Alternative 7C	Effects would be the same as Alternative 7B.
Alternative 7D	Effects would be the same as Alternative 7B.

TABLE 4-1 (cont.)
COMPARATIVE IMPACTS OF ALTERNATIVES

<u>Alternative</u>	<u>Total First Cost</u>	<u>Net Benefits</u>	<u>Benefit/Cost Ratio</u>
Base	—	—	—
Future W/O Project	—	—	—
Alternative 7B -Selected Plan	\$270,512,000	\$6,876,000	1.24
Alternative 7A	\$264,003,000	\$6,778,000	1.24
Alternative 7C	\$277,022,000	\$6,770,000	1.23
Alternative 7D	\$283,531,000	\$6,642,000	1.22

5. AFFECTED ENVIRONMENT

Environmental Conditions

5.1 The Grand Prairie area of eastern Arkansas is located on one of the highest Pleistocene terraces within the Mississippi Alluvial Valley. The Grand Prairie terrace is over 50 feet higher than the White River floodplain which bounds it on the east, and the river has carved distinct bluffs into the terrace along this boundary. Along the bluffs, erosion has cut ravines down to the White River bottoms, forming hills in the typically flat terrace. According to Saucier (1974), the terrace consists of meander belt and backwater sediment deposits. A thin layer of loess covers thick deposits of clays and silty clays which are the dominant sediments of the terrace to a depth of 60 to 100 feet (Saucier 1974). The clays and silty clays are underlain by tens of feet of sand and gravel deposits which extend down to the suballuvial surface (Saucier 1994). Prior to the introduction of rice cultivation in the early 20th Century, a vast tallgrass prairie occupied this terrace. Today, agricultural crops dominate the Grand Prairie landscape. Rice and soybeans are the principal crops cultivated in this area; but wheat, corn, and grain sorghum are also grown.

5.2 The project area encompasses approximately 362,662 acres and includes significant portions of Prairie and Arkansas counties and small portions of Monroe and Lonoke counties (see Plates 1 and 2, Main Report). Agricultural land comprises about 70% (254,406 acres) of the project area with wetlands (28,288 acres) and upland forest (14,940 acres) collectively occupying only 12%. There are numerous streams and ditches within the project area; LaGrue, Little LaGrue, and Mill bayous are among the largest of the streams. The White River occupies only a small portion of the aforementioned project area within the vicinity of the proposed pumping station at DeValls Bluff, Arkansas (see Plate 2, Main Report). However, the selected plan requires water withdrawals from the White River; and the portion of the White River from Interstate 40 (mile 126.6) downstream to St. Charles, Arkansas (mile 57.0), was designated as the reach of the river potentially affected by the project. Therefore, the study area was expanded so that potential project impacts to the river and its adjacent floodplain could be assessed. The study area includes the original 362,662-acre project area and the 69.6-mile reach of the White River and its floodplain.

5.3 The alluvial aquifer in the Grand Prairie has been severely depleted. Since the Grand Prairie is a premiere rice- and soybean-producing region, groundwater from this aquifer has been used extensively for crop irrigation. Groundwater is also the primary source of water in this area for catfish and bait fish farming. Furthermore, the presence of an impermeable clay hardpan severely restricts recharge of the alluvial aquifer.

5.4 Under future without-project conditions, the alluvial aquifer will continue to deplete. It is estimated that only 8.7% of the water annually mined from the aquifer will be available to farmers for irrigation by the year 2015. Substantial increases in the amount of public land are likely due to probable expansions of one state wildlife management area and two federal refuges.

Significant Resources

5.5 Discussions of existing conditions and future without-project conditions of significant resources are restricted to the 362,662-acre project area and the White River and its floodplain from Interstate 40 (mile 126.6) downstream to St. Charles (mile 57.0). Agricultural practices, groundwater depletion, public land acquisitions, and the “swampbuster” provision of the 1985 Food Security Act are major factors influencing existing and future without-project conditions within the study area.

RIVERS AND STREAMS

5.6 The White River from mile 57.0 to 126.6 is a large, turbid, warmwater stream. Channel top widths vary from 300 feet to 800 feet (U.S. Army Corps of Engineers 1980). Channel substrate is composed primarily of sand and clay, and the river is dredged annually to remove sediment accumulations which could impede barge traffic. Mean monthly discharges range from 18,310 CFS in October to 55,660 CFS in April. Forty-seven species of fish were collected from the White River during this study (see Appendix C, Section V). Commercial and sport fishing are popular activities within this portion of the river. However, the most productive fisheries are found within the numerous oxbow lakes adjacent to the river. Mussels are also prolific in the White River; 34 species of mussels, including the endangered pink mucket mussel (*Lampsilis abrupta*), were collected from this river during a recent study (Christian 1995).

5.7 Numerous smaller tributary streams are found within the project area. Stuttgart King Bayou, Sherril Creek, Mill Bayou, South Mill Bayou, LaGrue Bayou, Little LaGrue Bayou, Peckerwood Lateral, Wolf Island Slash, Wildcat Ditch, Hurricane Bayou, Hurricane Creek, Washington Creek, Oak Creek, Payne Creek, Johnson Branch, Elm Prong Mill Bayou, East Stuttgart King Bayou, Lost Island Bayou, Caney Bayou, Barnes Creek, Honey Creek, Pate Branch, South Fork of Hurricane Creek, Little Hurricane Creek, Buck Creek, Clearpoint Creek, Holt Branch as well as many unnamed channels are located in the project area. All of these streams are tributaries of the White River except for Mill Bayou and Stuttgart King Bayou which are tributaries of the Arkansas River. Of the 28 streams, LaGrue Bayou, Little LaGrue Bayou, Barnes Creek, Honey Creek, Sherril Creek, Stuttgart King Bayou, Mill Bayou, Elm Prong Mill Bayou, and South Mill Bayou are among the largest. Many of the streams contain weirs and/or dams for pooling water for irrigation withdrawals. The 2,400-acre Peckerwood Lake, located approximately 10 miles north of Stuttgart, was formed by damming LaGrue Bayou; it is the largest reservoir in the project area. Peckerwood Lake is a privately owned multi-purpose reservoir providing recreation and irrigation water. Many of the tributary streams are intermittent, particularly during hot, dry summers, due to their relatively small size and high water withdrawal rates. Consequently, diversity and abundance of fishes in tributaries are considerably less than in the White River.

5.8 With the continued depletion of the alluvial aquifer, farmers will rely more on capturing surface runoff and withdrawals from existing streams. Thus, tributary streams will continue to be

impacted by agricultural activities. The White River is an alternative source of surface water, but its utilization may be cost-prohibitive to area farmers because large pumps are necessary to lift water from the river to the surrounding bluffs.

GROUNDWATER

5.9 The Quaternary alluvium, commonly referred to as the alluvial aquifer, is comprised of two substrata. The upper substratum is a confining layer consisting of clay deposits, and the lower substratum is composed of sands and gravels (Cushing et al. 1964, Boswell et al. 1968). Although the average thickness of the clay confining layer is about 60 feet, it varies from 0 to 100 feet. This confining layer severely restricts recharge of the alluvial aquifer. The water-bearing sand and gravel deposits range from 60 to 140 feet thick but are 80 to 100 feet thick in most portions of the project area.

5.10 The alluvial aquifer has been the principal source of agricultural water in the Grand Prairie for over 80 years. In excess of 90% of all groundwater use in the Grand Prairie is attributed to agriculture; approximately 96% of the agricultural use is for crop irrigation and about 4% is for aquaculture (i.e., catfish and bait fish farming). The heavy agricultural demand placed on groundwater has caused severe depletion of the alluvial aquifer. U.S. Geological Survey and Arkansas Soil and Water Commission data indicate that the saturated thickness of the alluvial aquifer has diminished as much as 90 feet in some portions of the Grand Prairie.

5.11 The present annual irrigation demand is 481,195 acre feet of water, and approximately 408,007 acre-feet of water was extracted from the alluvial aquifer in 1995 for agricultural purposes. It is difficult to project exactly when the groundwater reserves will be exhausted; however, studies estimate that they will be depleted by the year 2015 if withdrawals continue at the current rate. However, the State of Arkansas will likely declare this region a critical groundwater shortage area several years prior to the year 2015 and begin limiting withdrawals to the annual recharge rate.

WATER QUALITY

5.12 Most water used to irrigate cropland in the Grand Prairie area is pumped from the alluvial aquifer. In order to determine existing sediment concentration levels in the White River, Memphis District personnel performed a sediment analysis under a variety of flow conditions. A detailed description of the analysis and the results are reported in the document "Sediment Transport" which is found in Appendix B, Section I, Hydraulics and Hydrology. According to this report, the average sediment concentration level in the White River is 74 mg/l. The suspended sediment concentrations of the river are now slightly lower than historic levels found in the U.S. Environmental Protection Agency (EPA) Storage and Retrieval of Environmental Data (STORET) files.

5.13 In addition to the above Corps sediment analysis, the Ground Water Institute at the University of Memphis, led by Dr. John Smith, conducted studies during 1996 to determine the current water quality of existing streams, reservoirs, wells, and tailwater recovery systems. This

report is found in Appendix C, Section III.

5.14 Examination of the STORET data file shows no significant changes in Ph, hardness, or temperature from the historic values for the area streams and the White River. Dissolved solid levels and alkalinity are running lower than the historic values for area streams and the White River. Also, alkalinity and dissolved solid values for the White River are approximately equal to the levels found in area streams. All dissolved solid values are well within the EPA limit of 15,000 mg/l. Suspended solid levels for the receiving streams are also about equal to those of the river. EPA has not established quantitative limits for suspended solids as they pertain to aquatic life.

5.15 No significant changes in water quality are expected under future without-project conditions.

AQUATIC RESOURCES

5.16 The study area portion of the White River, Interstate 40 downstream to St. Charles, contains a diverse warmwater fishery. Forty-seven species of fish were collected during a study conducted by the U.S. Army Waterways Experiment Station (WES), see Appendix C, Section V. However, the most productive fisheries are within the numerous oxbow lakes adjacent to the river (Dr. Jack Killgore, WES, pers. comm.). The White River provides an important commercial fishery; although specific study area information is not available, the total White River commercial fish harvest is valued at over \$3,000,000 annually (Arkansas Game and Fish Commission data). Sportfishing is an important recreational activity on the river and its associated oxbow lakes.

5.17 The fisheries of the smaller tributary streams are limited due to excessive removal of surface water for irrigation purposes. The WES study determined that fish abundance and species diversity are lower in these smaller streams compared to the White River; only 33 species of fish were sampled collectively in the smaller streams. Sportfishing is virtually nonexistent on these streams except on isolated reaches of larger streams that have been dammed for irrigation purposes. There are 15,556 acres of agricultural reservoirs in the project area. Approximately 60 to 70% of these reservoirs are designed and managed to provide sport fisheries as well as irrigation water (Lori Walton, WRRIWDD, pers. comm.). However, most of these multi-purpose reservoirs receive only moderate fishing pressure due to a lack of public access. Fair to moderate fisheries also exist in many of the larger irrigation canals, but fishing is limited due to restricted access.

5.18 Species diversity and abundance of mussels in the White River is relatively high compared to other major streams in eastern Arkansas (Craig Uyeda, Arkansas Game and Fish Commission, pers. comm.). Thirty-four species of mussels, including the pink mucket pearly mussel (*Lampsilis abrupta*), were collected during a recent mussel survey of the White River from the vicinity of Batesville, Arkansas, to its mouth (Christian 1995). This study identified numerous mussel beds within the study area reach of the river; mussel densities in these beds range from one mussel per square meter to greater than 10 mussels per square meter. The U.S. Fish and Wildlife Service (USFWS) conducted a reconnaissance mussel survey of LaGrue Bayou and its tributaries at 15 road crossings in order to gain insight as to the diversity and abundance of mussels within the smaller

tributary streams and to obtain baseline data for project impact assessment (see Appendix C, Section VI, Part A). Mussels were found only in the main stem of LaGrue Bayou. Live specimens or fresh shells of 12 native mussel species were found, and some Asian clam (*Corbicula fluminea*) shells were collected; no Federally listed endangered or threatened mussels were discovered. Mussels were not found at all sample sites, and only low density populations were discovered at any sites. The USFWS considers channel modification, agricultural runoff, and water removal as the primary factors limiting mussel populations within the LaGrue Bayou drainage.

5.19 Since no significant increase in water withdrawals from the White River is foreseen for future without-project conditions, fish populations in the river are expected to remain relatively stable. The status of native mussels in the White River should remain similar to existing conditions over the next 50 years. However, these mussels could be adversely impacted if the abundance of exotic zebra mussels (*Dreissena polymorpha*) increases. Zebra mussels are found in the White River, but are not yet present in great numbers (Steve Filipek, Arkansas Game and Fish Commission, pers. comm.; Dr. John L. Harris, Arkansas State University, pers. comm.). Zebra mussels negatively impact native mussels by competing for space and food. Also, zebra mussels are known to encrust on native mussels; and apparently many native mussels die because zebra mussels impair their movements and damage their shell edges (O'Neill and MacNeill 1991). Fish and mussel populations within the tributary streams will remain degraded due to the continued depletion of the alluvial aquifer and the subsequent heavy reliance on surface water for crop irrigation. Many of the multi-purpose reservoirs will likely be managed solely for agricultural purposes because of the increasing need to utilize available surface water.

BOTTOMLAND HARDWOOD FOREST

5.20 Bottomland hardwood forests of the Mississippi Alluvial Valley have been reduced from approximately 24,690,000 acres historically to less than 4,938,000 acres today (Ducks Unlimited 1994). A net annual loss of 300,000 acres of bottomland hardwoods occurred within the conterminous United States between the 1950's and the 1970's; the greatest reductions during this period occurred in Louisiana, Mississippi, and Arkansas (Frayer et al. 1983). From the mid-1970's to the mid-1980's, almost 900,000 acres of bottomland hardwood forest were lost to agriculture in the Lower Mississippi Alluvial Plain (Hefner et al. 1994). By 1985, only 875,000 acres of Arkansas' original 8,000,000 acres of bottomland hardwood forest remained (Arkansas Game and Fish Commission 1988).

5.21 Bottomland hardwood forests are productive in terms of wildlife and commercial forest products; and, when flooded, these forests provide aquatic habitat for fish, waterfowl, and other wetland wildlife. White-tailed deer, swamp rabbits, gray and fox squirrels, wood ducks, and mallards are common game species found throughout this habitat type. These forests also support an abundance of song birds, small mammals, reptiles, and amphibians. Commercial forest products derived from these woodlands include lumber, veneer, and fuel.

5.22 Approximately 19,931 acres of bottomland hardwood forests are found within the 362,662-

acre project area. The majority of these bottomland hardwood forests are an oak/hickory climax type. Overcup oak, water oak, willow oak, Nuttall oak, cherrybark oak, water hickory, American elm, green ash, shagbark hickory, and sweetgum are among the most common canopy species in the project area. Tree species composition of these forests varies according to the wetness of the growing sites. On relatively wet sites, the dominant species are overcup oak and water hickory, with some pumpkin ash and water locust occurring at certain sites. On drier sites the major tree species are willow oak, water oak, Nuttall oak, and sweetgum, with green ash, American elm, and sugarberry being common associates. Baldcypress, water tupelo, swamp tupelo, and black willow are found primarily in frequently and permanently inundated areas.

5.23 Understory species include swamp privet, deciduous holly, swamp dogwood, cedar elm, persimmon, and red maple. Ground cover commonly includes asters, hibiscus, false nettle, wild garlic, violets, mint, green dragon, day-flower, sedges, rushes, and grasses. The general character of the woodland is strongly affected by the great number of vines including various species of grape, rattan, lady's-eardrop, greenbrier, poison ivy, climbing dogbane, Virginia creeper, and honeysuckle.

5.24 As part of an impact assessment of water withdrawals from the White River on floodplain wetlands, topographic and vegetative surveys were conducted on the floodplain west of Clarendon, Arkansas; and wetland zones within the surveyed area were defined according to Wharton et al. (1982). The following zones and bottomland hardwood associations were determined: Zone 1 (permanently inundated) - open water; Zone 2 (intermittently exposed) - black willow, water elm-water tupelo-bald cypress, and bald cypress-water hickory; Zone 3 (semipermanently inundated) - overcup oak-water hickory; Zone 4 (seasonally inundated or saturated) - overcup oak-Nuttall oak, sugarberry-green ash-American elm; and Zone 5 (temporarily inundated or saturated) - willow oak-green ash-cedar elm.

5.25 Under future without-project conditions, the "swampbuster provision" of the 1985 Food Security Act should deter the clearing of additional bottomland hardwood acreage for agricultural purposes. Also, probable cleared land acquisitions and reforestation by Wattensaw WMA, the White River National Wildlife Refuge (NWR), and Cache River NWR will increase the amount of bottomland hardwood forest in the study area (see STATE AND FEDERAL HOLDINGS, EIS-52 - EIS-53). However, a recent study (Waldron and Anderson 1995) revealed that wetlands, including bottomland hardwoods, along the White River could be adversely impacted by the continued depletion of the alluvial aquifer. Most of the wetlands along the river are presently a potential source of recharge to the alluvial aquifer. Some wetlands constantly gain water from the aquifer, some are strictly a source of recharge to the aquifer, and other wetlands (influenced temporally and spatially) both recharge the aquifer and receive water from it. According to this study, distances from the ground surface of the wetlands to the water surface in the alluvial aquifer increase under future without-project conditions, inducing a "drying" effect on the wetlands. Some of the wetlands that depend primarily on groundwater to maintain saturated soil conditions could possibly become almost completely desiccated (Dr. Jerry Anderson, Ground Water Institute, University of Memphis, pers. comm.). However, it is important to note that inferences made base on this study can only be applied regionally. The groundwater flow model used in this study was developed using grid cell

spacings of one mile by one mile, and all geologic parameters (e.g., aquifer conductivity, aquifer thickness) and groundwater pumpage were averaged over that area for each cell. Therefore, the precision of the model is insufficient to make inferences regarding specific wetlands.

UPLAND HARDWOOD FOREST

5.26 Historically, upland hardwood forests were common throughout the Grand Prairie. Although a tallgrass prairie dominated the landscape, woodlands occurred along streams and drainages and in topographic depressions. Woodland communities adjacent to streams and drainages varied in plant composition over a topographic gradient. Wetlands occupied areas immediately adjacent to the streams and drainages; however, woodland composition changed as the soil conditions became dryer away from the streams. According to Thomas L. Foti (Arkansas Natural Heritage Commission, pers. comm.), the relative juxtaposition was stream, swamp, bottomland hardwood forest, upland hardwood forest, upland hardwoods/prairie savanna, tallgrass prairie. Since they were located on the drier sites, upland hardwood forest, savanna, and prairie were the floristic communities impacted most by cultivation in the Grand Prairie region; only prairie and savanna were impacted more than upland hardwood forests (Thomas L. Foti, pers. comm.).

5.27 The project area contains approximately 14,940 acres of upland hardwood forest. Upland forest cover types are oak and oak-hickory associations. Common tree species found within these woodlands include post oak, white oak, southern red oak, northern red oak, water oak, shagbark hickory, mockernut hickory, and bitternut hickory.

5.28 No significant impacts to upland hardwood forests are anticipated for future without-project conditions. Although timber may be harvested periodically from these forests, it is not projected that any significant amounts of upland forest will be permanently cleared. Furthermore, Wattensaw WMA will likely acquire and reforest additional land, increasing the amount of upland hardwoods within the study area (see STATE AND FEDERAL HOLDINGS, EIS-51 - EIS-52).

WETLANDS

5.29 Wetlands are defined by Title 33, Part 323 CFR, dated 22 January 1977, Regulatory Program of the Corps of Engineers:

“Wetlands means those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions.”

5.30 The Memphis District contracted the National Wetlands Inventory (NWI), St. Petersburg, Florida, to digitize NWI wetland topographic quad maps of the project area. The NWI digital wetland data were then incorporated into the project geographic information system data base. Since the NWI maps were developed based on interpretation of aerial photography, wetland status at potential project impact sites was verified in the field. NWI wetland types are classified based on

Cowardin et al. (1979). A total of approximately 28,387 acres of wetlands exist within the project area.

5.31 Specific NWI wetland types with similar vegetation and hydrology were grouped into broader wetland habitat categories. Wetland habitat types determined by the Memphis District Corps of Engineers to exist within the project area are:

1. Bottomland Hardwood Forest - This palustrine wetland (i.e., wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens) is a broad-leaved deciduous forest that is temporarily or seasonally flooded. These forests are comprised of various bottomland hardwood associations (excluding baldcypress and tupelo) and total approximately 15,860 acres. See EIS-46 - EIS-48 for a vegetative description of bottomland hardwood forests.
2. Forested Swamp - This palustrine forest is found on semipermanently and permanently flooded sites within the project area. It is comprised of broad-leaved deciduous and/or needle-leaved deciduous trees. Baldcypress, water tupelo, swamp tupelo, and black willow are dominant tree species. Presently, forested swamps occupy approximately 4,071 acres. Note - Although this forest is considered a bottomland hardwood forest type, it was placed into this separate wetland habitat category due to its tolerance of wetter site conditions.
3. Scrub/Shrub Swamp - This palustrine wetland is dominated by woody vegetation less than 20 feet tall and occurs on sites that are temporarily, seasonally, semipermanently, and permanently flooded and sites that are intermittently exposed. These areas are comprised of true shrubs, young trees, and shrubs or trees that are small or stunted because of environmental conditions. Most of these wetlands are dominated by buttonbush and/or black willow. Approximately 6,987 acres of scrub/shrub swamp exist in the project area.
4. Marsh - This category includes both lacustrine and palustrine wetlands. The lacustrine system includes wetlands and deepwater habitats that have the following characteristics: (1) located in topographic depression or old stream channel that is separated from the main channel; (2) lack trees, shrubs, persistent emergents, emergent mosses, or lichens with areal coverage greater than 30%; and (3) site must exceed 20 acres. However, similar wetlands and deep water habitats totaling less than 20 acres are included in the lacustrine system if water depth in the deepest portion of the site exceeds 6.6 feet during periods of low water. Lacustrine marsh consists of littoral aquatic beds that are semipermanently or permanently flooded and dominated by rooted vascular plants (e.g., pondweeds, water lilies, water smartweed, water shield); aquatic beds are dominated by plants that grow primarily on or below the water surface for the majority of the growing season in most years. The palustrine marsh consists of (1) aquatic beds that are located on semipermanently and permanently flooded sites and (2) wetlands that are dominated by persistent emergent vegetation (e.g., cattail, sedges, purple loosestrife, water willow) and located on semipermanently/permanently flooded and intermittently exposed sites. The project area contains approximately 1,370 acres of marsh.

5. Dead Timber - This category represents areas of dead and dying bottomland hardwood forest. This habitat type is found on sites that have undergone hydrologic changes; these areas have been impacted by beaver ponds or by impoundments created for irrigation purposes. Dead timber exists on sites that are intermittently exposed and semipermanently and permanently flooded. There are only approximately 99 acres of dead timber within the project area.

5.32 Under future without-project conditions, the “swampbuster” provision of the 1985 Food Security Act should limit the conversion of wetlands to agricultural lands. Also, the possible purchase and reforestation of cleared wetlands by Wattensaw WMA and the White River and Cache River NWRs could increase the amount of wetlands within the study area. However, wetlands along the White River could be impacted by the drying effect caused by groundwater depletion (see BOTTOMLAND HARDWOOD FOREST, EIS-46 - EIS-48).

PRAIRIE

5.33 In Louisiana and eastern Arkansas, a series of discontinuous tallgrass prairies developed on poorly dissected Pleistocene terraces of the Mississippi Alluvial Valley (Irving 1980, Irving et al. 1980). Covering almost 500,000 acres, the Grand Prairie was the largest of these prairies (Thomas L. Foti, pers. comm.). The approximate boundaries of the Grand Prairie were the Arkansas River on the south, Wattensaw Bayou on the north, the White River and LaGrue Bayou on the east, and Bayou Meto and Two Prairie Bayou on the west (Foti 1971).

5.34 In contrast to most of the Mississippi Alluvial Valley (MAV), vegetation of the Grand Prairie was dominated by prairie grasses and forbs. The Grand Prairie terrace is composed of thick beds of clay that are capped with a thin layer of loess topsoil. The flat topography and thin soil make the area drouthy, favoring prairie vegetation, even in this area with 52 inches of rain per year. According to Thomas L. Foti (pers. comm.), the predominant grasses generally were big bluestem (*Andropogon gerardi*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum avenaceum*), and little bluestem (*Schizachyrium scoparium*). Although the total extent of the Grand Prairie terrace was approximately 1,400 square miles, actual prairie grassland occupied only about half that (Corbet 1966); forests grew on the remainder of the terrace. Narrow strips of woodland occurred along streams and drainages that dissected the prairie, and groves or “islands” of trees occupied topographic depressions throughout the prairie (Thomas L. Foti, pers. comm.)

5.35 From the time of settlement until rice cultivation was introduced in the early 20th Century, the Grand Prairie was primarily utilized for pasture and hay production for livestock (Foti 1971). Following the introduction of rice, the Grand Prairie became the primary rice-producing region of Arkansas. Cultivation has reduced this once vast grassland to 10 widely scattered remnants totaling approximately 650 acres. Approximately half of the remaining prairie is privately owned, with the remainder managed by the Arkansas Natural Heritage Commission (ANHC). About 80 to 90 percent of the prairie is contained within the project area including three remnants under the management of the ANHC: the 257-acre Railroad Prairie Natural Area (only approximately 150 acres is actually

prairie), the 41-acre Roth Prairie Natural Area, and the 29-acre Konecny Prairie Natural Area. See Appendix C, Section VII, Maps 1-A - 1-C, 4-B, and 2-B, respectively, for locations of these ANHC-managed prairies. Although the ANHC prairies will be protected and managed, the future of the privately owned prairies over the 50-year project life of this study is uncertain.

WILDLIFE

5.36 According to Nichols and Hines (1987), the Southern Mississippi Flyway (i.e., Arkansas, Tennessee, Mississippi, Alabama, Louisiana) winters approximately 26-30% of the North American mallard population. Many portions of the Mississippi Delta north of the Gulf Coast are important wintering areas for mallards and wood ducks (Reinecke 1981); of the almost 1,500,000 mallards that winter in the Mississippi Delta, approximately 1,100,000 congregate in Arkansas (Bellrose 1979). One of Arkansas' most renowned natural resources is the migratory and resident waterfowl that utilize the state's wetlands and agricultural fields for resting, feeding, and brood rearing.

5.37 Eastern Arkansas contains the most important waterfowl habitat in the state. In fact, the Grand Prairie region and associated White River Bottoms is perhaps the most important wintering area in North America for mallards (Nichols and Hines 1987). The rice and soybean fields as well as the wetlands of the Grand Prairie provide important feedings areas for mallards and numerous other waterfowl species. Although the mallard is the most notable waterfowl species inhabiting the Grand Prairie, various other waterfowl utilize the project area as well. Other important species include the wood duck, pintail, blue-winged and green-winged teals, gadwall, American widgeon, black duck, ring-necked duck, and snow and Canada geese.

5.38 Waterfowl are so plentiful and waterfowl hunting so popular in the Grand Prairie that the city of Stuttgart, located in the heart of the project area, is known as the "duck hunting capitol of the world." Stuttgart annually hosts the Wings Over the Prairie Festival and associated World Duck Calling Championship each November.

5.39 The mourning dove is an important game bird within the project area; doves are plentiful because of the abundance of cropland. Mourning doves feed primarily on weed seeds and grains; and although they prefer small seeds, they also feed on larger items such as soybeans. Since doves are highly mobile, they need little escape cover and only limited cover (e.g., farm shelter belts, ditch bank woods) for nesting. The wild turkey is also found within the study area, but it is primarily restricted to the large corridor of woodlands along the White River and associated bluffs. Bobwhite quail are found within the project area but are scarce due to the large expanse of agricultural fields; quail prefer areas with both ample protective cover and openings.

5.40 Raptors, wading birds, and shore birds are among the nongame birds inhabiting the study area. Common raptors include the red-tailed hawk, red-shouldered hawk, marsh hawk, turkey vulture, black vulture, barred owl, screech owl, and American kestrel. The great blue heron, little blue heron, yellow-crown night heron, green heron, cattle egret, common egret, and snowy egret are wading birds indigenous to the Grand Prairie region. Over 20 species of shore birds utilize the study

area (see Appendix C, Section VI, Part A); some of the more common species are the killdeer, long- and short-billed dowitchers, common snipe, pectoral and least sandpipers, and lesser and greater yellowlegs. Shore birds feed on invertebrates found in shallowly flooded crop fields and wetlands and in the mudflats of reservoirs and other impoundments. The belted kingfisher; ruby-throated hummingbird; pileated, red-bellied and downy woodpeckers; Chuck-will's-widow; common nighthawk; and numerous passerine species inhabit the study area as well.

5.41 Eastern cottontail and swamp rabbits, squirrels, and white-tailed deer are important game mammals within the study area. These animals are common throughout much of Arkansas and many other southern states. The swamp rabbit is a close associate of wetlands and riparian habitats; therefore, it is found only along the streams and drainages within the study area. The eastern cottontail rabbit, on the other hand, is widely distributed throughout the study area, wherever protective cover is offered. Fox and gray squirrels are forest species and are, therefore, restricted to the study area woodlands. Deer are closely associated with woodlands, but are not as confined to them. Deer will venture into agricultural fields to feed, particularly at night. Other mammals found within the study area include red and gray foxes, mink, muskrat, beaver, spotted and striped skunks, bobcat, and coyotes. The black bear also inhabits the study area but is relatively scarce; it is primarily confined to the large corridor of woodlands along the White River.

5.42 In the absence of federal action, no permanent clearing of upland hardwood forest habitat is anticipated; and conversion of wetlands to agricultural land should be severely limited due to the "swampbuster" provision of the Food Security Act. Moreover, potential cleared land acquisitions and reforestation by Wattensaw WMA and the White River and Cache River NWRs could increase the amount of available wildlife habitat within the study area. However, since some wetlands along the White River will likely become "drier" as a result of continued aquifer depletion, wetland dependent wildlife such as shorebirds and waterfowl could be adversely impacted.

STATE AND FEDERAL HOLDINGS

5.43 Approximately 4,875 acres of the 19,596-acre Wattensaw State Wildlife Management Area (WMA), owned and managed by the Arkansas Game and Fish Commission (AGFC), are contained within the northern portion of the project area. Water comprises approximately 1% (210 acres) of the WMA, and approximately 83% (16,265 acres) of the total area is forested with about 67% of the woodlands being upland hardwood forest and approximately 33% being bottomland hardwood forest (Chris Ware, AGFC, pers. comm.). This WMA provides both consumptive and non-consumptive recreational opportunities. White-tailed deer hunting, turkey hunting, squirrel hunting, and fishing are the most popular forms of consumptive recreation; and bird watching, archery, and hiking are the primary non-consumptive forms of recreation (Craig Uyeda, pers. comm.).

5.44 The ANHC owns or has conservation easements on five ecologically important natural areas that it protects and manages--the 257-acre railroad Prairie, 41-acre Roth Prairie, 29-acre Konecny Prairie, 22-acre Konecny Grove, and 437-acre Smoke Hole Natural Area (tupelo forest). See Appendix C, Section VII, Maps 1A - 1-C, 4-B, 2-B, and 2-A, respectively, for locations of these

natural areas.

5.45 The U.S. Department of Agriculture, Agriculture Research Service, owns and operates the 86-acre Stuttgart National Aquaculture Research Center (SNARC), located approximately nine miles east of Stuttgart, Arkansas. Offices, laboratories, and about 86 research ponds are located on this property. The 914-acre Rice Research and Extension Center (RREC) is located immediately adjacent to the SNARC. It is owned and operated by the University of Arkansas.

5.46 The majority of lands within the 154,000-acre White River National Wildlife Refuge (NWR) and the 42,000-acre Cache River NWR are contained within the study area portion of the White River floodplain from Interstate 40 downstream to the town of St. Charles (Craig McBroom, U.S. Fish and Wildlife Service, pers. comm.). These NWRs contain some of the most ecologically important bottomland hardwood forests and forested swamps remaining within the Lower Mississippi Valley. Major recreational activities on these refuges include hunting, fishing, wildlife observation, hiking, camping, and picnicking. This large expanse of public lands offers exceptional waterfowl, deer, and turkey hunting.

5.47 Under future without project conditions, Wattensaw WMA will likely expand its boundaries utilizing funds recently made available through the Arkansas Conservation Sales Tax passed in November 1996 (Craig Uyeda, pers. comm.). However, according to Craig Uyeda (pers. comm.), the amount of land obtained for this WMA over the next 50 years is impossible to project and will be limited primarily by the number of willing sellers. The U.S. Fish and Wildlife Service (USFWS) plans to expand substantially the size of the Cache River and White River NWRs, but it is impossible to predict both the amount of total acquisitions for the two refuges and the amount of land obtained within the study area portion of the White River floodplain (Craig McBroom, pers. comm.). A portion of the WMA and refuge acquisitions will likely comprise agricultural lands; these cleared lands will be reforested or managed as moist-soil units or food plots. The ANHC natural areas, SNARC, and RREC should remain similar to existing conditions.

ENDANGERED AND THREATENED SPECIES

5.48 The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species that utilizes the study area. One endangered fish, pallid sturgeon (*Scaphirhynchus albus*), could potentially occur within the White River; and one endangered mussel, pink mucket pearly mussel (*Lampsilis abrupta*), is known to inhabit the study area reach of the White River. Also, two other endangered mussels, Curtis pearly mussel (*Epioblasma flotentina curtisi*) and fat pocketbook pearly mussel (*Potamilus capax*), are reported to have historically occurred in the White River. However, these mussels have not been collected in recent surveys; and it is unlikely that they still exist in the White River. Due to this uncertainty of occurrence and the fact that life histories of native freshwater mussel species are similar, project impacts were assessed only on the pink mucket pearly mussel. Life history, habitat preference, distribution, and various other information regarding the pallid sturgeon, pink mucket pearly mussel, and bald eagle were obtained, in part, from their respective recovery plans (Dryer et al. 1992, Ahlstedt 1985, Murphy et al. 1984).

Pallid Sturgeon

5.49 The pallid sturgeon was listed as an endangered species on 9 September 1990 pursuant to the Endangered Species Act of 1973. Based on catch records, the pallid sturgeon is believed to occur from the mouth of the Mississippi River upstream to the confluence of the Missouri River, in the lower 35 miles of the St. Francis and Big Sunflower rivers, in the Missouri River from its mouth to Fort Benton, Montana, in the lower 200 miles of the Yellowstone River, in the lower 21 miles of the Platte River, and the lower 40 miles of the Kansas River. The pallid sturgeon is one of the largest and rarest fishes in the Mississippi River and Missouri River basins. Although there are no records of pallid sturgeon being caught in the White River, it is possible they are inhabitants of this river because they have been collected from the Mississippi River near the mouth of the White (Dr. Jack Killgore, pers. comm.).

5.50 Pallid sturgeon are opportunistic feeders that eat insects, crustaceans, mollusks, annelids, fish, and eggs of other fish. Fish have been noted to comprise a high percentage of its diet. Little is known about age, growth, reproduction, and other life history variables. Although the habitat preferences of the pallid sturgeon are not well known, it is thought they require large, turbid, free-flowing riverine habitat with rocky or sandy substrate. They are usually found on the bottoms of streams on sand flats or gravel bars, and they apparently prefer areas with strong currents in or near the main channel.

5.51 The pallid sturgeon has declined dramatically throughout its approximately 3,500-mile range over the past 20 years. The reason for this decline has been extensive alteration of the riverine habitats of the Missouri River and to a lesser extent the Mississippi River. Within the Missouri River system, much of the fish's habitat has been modified through channelization, construction of impoundments, and related changes in flow regime. These changes have impeded the sturgeon's movements, destroyed or altered its spawning and nursery areas, decreased habitat diversity, reduced its food sources or ability to feed, and altered substrates and other environmental factors necessary for survival. The portion of the Mississippi River within the sturgeon's range has been deepened and constricted by numerous dikes, wing dams, and bank revetments. This has caused changes in fish fauna composition; in the lower channelized portion of the river, species adapted for life in turbid, "pre-development" riverine habitat have declined in abundance while pelagic planktivores and sight-feeding carnivores have increased in abundance. The pallid sturgeon is likely being adversely impacted by pollution over much of its range, and hybridization with the shovelnose sturgeon (*Scaphirhynchus platyrhynchus*) threatens species integrity. Also, this fish is taken as a "bycatch" of commercial fishermen.

5.52 Under future without-project conditions, no significant modifications to the configuration or flow regime of the White River are anticipated. Therefore, no adverse impacts to pallid sturgeon are expected if indeed any inhabit the White River.

Pink Mucket Pearly Mussel

5.53 The pink mucket pearly mussel was proposed as an endangered species in September 1975 and listed in June 1976. Historical records indicate that this mussel is found primarily in the Tennessee, Cumberland, and Ohio river basins with occasional records from the Mississippi River drainage. Historically, the pink mucket pearly mussel was widely distributed, occurring in 25 river systems. However, this species was never collected in huge numbers from any one site and was always considered uncommon or rare. It is known to occur in 16 river systems at present with the largest concentrations in the Tennessee, Cumberland, Osage, and Meramac rivers. The pink mucket is known to occur in the White River. Christian (1995) collected this mussel at two locations within the study area portion of the White River, Lambert's Landing Bend (river mile 63.5) and near the town of Clarendon (river mile 99.0).

5.54 Freshwater mussels, including the pink mucket, are sedentary benthic invertebrates that bury in the substrate, exposing only the posterior most portion of the shell and siphons to the water column. The pink mucket is found in medium to large (66 feet wide or greater) rivers in silt, sand, gravel, rubble, and bolder substrates. It seems to prefer large rivers (Tennessee, Ohio, and Cumberland rivers) with moderate to fast-flowing water, at depths ranging from about 1.5 to 26.0 feet. In the White River, the pink mucket is found in a variety of substrates including boulders (the study area portion of the river does not contain boulders), rubble, gravel, soft and hard clays, sand, and silt (Christian 1995); however, it does not occur at depths less than approximately 10 feet below the water surface at low water (Dr. John L. Harris, pers. comm.).

5.55 The life history of the pink mucket pearly mussel is not known, but is thought to be similar to other freshwater mussels. Males release sperm into the water and currents transport it to females downstream. Fertilization takes place in the gills of the females, and fertilized eggs are held in the posterior section of the outer gills. After the larvae (glochidia) are released into the water, they attach to passing fish. The glochidia encyst and live as parasites for 8 to 12 weeks. The glochidia develop into miniature mussels during this period, and then the cysts rupture to release them. This "hitchhiking" aids in the distribution of an organism whose locomotion is otherwise extremely limited.

5.56 Numerous species of freshwater mussels have been extirpated in some river systems within the United States. In general, the reasons for the decline in freshwater mussels are not completely understood. Freshwater mussels are particularly vulnerable to stream disturbances such as pollution, siltation, and impoundments due to their longevity (up to 50 years) and relative immobility. Habitat perturbation and destruction due to stream impoundments for hydro-electric power production, navigation, flood control, and recreation are perhaps the greatest factors contributing to the decline of freshwater mussels. Mussel species that are unable to adapt to the temperature alterations, flow reductions, and anoxic conditions induced by impoundments are eliminated. Mussel diversity and abundance is usually higher in streams with sand and/or gravel substrates; these substrates are generally found in running water.

5.57 Dredging, agricultural activities, logging, strip mining, road construction, etc., increase stream silt transport. Elevated suspended solid levels inhibit feeding by filter-feeding organisms such as mussels. Suspended solids are abrasive to the gills of mussels and can also clog gills at high levels. Freshwater mussels need clean, flowing water over a stable substrate; even a 0.24-inch layer of silt can “smother” some species of mussels. Siltation can indirectly affect mussel life cycles by impacting host fish. Silt can impact fish by smothering eggs and larvae and by covering spawning beds and nursery habitat.

5.58 Municipal, industrial, and agricultural pollution is discharged into many streams across the United States. The degree of impact pollution has on mussels varies according to a complex of interrelated factors. However, pollution has been attributed to the extirpation of mussels in portions of a number of streams.

5.59 In the absence of federal action, the status of the pink mucket pearly mussel in the White River should remain similar to existing conditions over the next 50 years. An exception to this could occur if the exotic zebra mussel (*Dreissena polymorpha*) proliferates. Zebra mussels have been collected in the White River, but are not yet present in great numbers (Steve Filipek, pers. comm.; Dr. John L. Harris, pers. comm.). Native mussels are adversely impacted by competition with zebra mussels for space and food. Also, zebra mussels are known to encrust on native mussels, and apparently many native mussels die because zebra mussels impair their movements and damage their shell edges (O'Neill and MacNeill 1991).

Bald Eagle

5.60 The bald eagle received protection as an endangered species below the 40th parallel in 1973. In 1978, the bald eagle was listed as endangered throughout the conterminous United States except in Oregon, Washington, Minnesota, Wisconsin, and Michigan where it was listed as threatened. The status of the bald eagle was upgraded to threatened throughout the conterminous United States in 1996.

5.61 The bald eagle is a large raptor that occurs primarily near sea coasts, rivers, and large lakes. This bird is an opportunistic feeder; food consumed by the bald eagle ranges from fish to other birds to carrion, with fish comprising the major portion of its diet. Catfish are a favorite food in the Southeast; but other fish, coots, gallinules, waterfowl, and turtles are also among the food items taken by bald eagles.

5.62 Bald eagles begin nesting in the Southeast in early September. Nests are built near (less than two miles) water in living pines or baldcypress. Egg laying begins in late October and peaks in late December. Clutches usually consist of one to two eggs but sometimes contain as many as three. Incubation begins from October to March and is completed in approximately 35 days. Fledging is completed in 10 to 12 weeks; however, parental care may extend for four to six weeks beyond fledging.

5.63 Historically, the bald eagle nested throughout the Coastal Plain of the Southeast and along major rivers and lakes. In Arkansas, bald eagle nests were scattered along the Mississippi and Arkansas river valleys until the early 1950s. Until recently, the last documented account of an eagle nest within the project area was probably in 1957 on Peckerwood Lake; however, this nesting was apparently unsuccessful. Following the release of the Grand Prairie Area Demonstration Project draft environmental impact statement, the Arkansas Natural Heritage Commission reported the occurrence of a bald eagle nest in a greentree reservoir located approximately six miles east-northeast of Stuttgart, Arkansas; and two mature eagles were observed in the immediate vicinity of the nest. However, the bald eagle is primarily considered a transient species within the study area, resting and feeding along the White River during its winter migration (Daniel Gregg, U.S. Fish and Wildlife Service, pers. comm.; Craig Uyeda, pers. comm). According to Daniel Gregg (pers. comm.), no large concentrations of eagles have been observed along the study area portion of the river; and no nest sites have recently been observed within this section of the White River floodplain..

5.64 The human population is growing tremendously in the Southeast, resulting in massive land alterations. Rapid and extensive development of eagle habitat is the most significant factor adversely impacting bald eagles in the Southeast. However, manmade reservoirs represent a substantial amount of new eagle habitat. At present, reservoirs are primarily providing wintering and non-nesting habitat; but they are gradually being used more by nesting eagles.

5.65 The shooting deaths of bald eagles has long comprised a large percentage of the annual mortality. However, deaths attributed to shooting have been declining. From 1961-65, 62% of bald eagle deaths were due to shooting. From 1975-81, only 18% of the deaths were attributed to shooting.

5.66 Environmental contaminants caused the most dramatic declines in eagle populations nationwide. The insecticide DDT and its metabolites inhibited calcium deposition which resulted in the thinning of eggshells and a corresponding decrease in reproductive success. However, eagle productivity has been recovering since a ban was placed on DDT in 1972.

5.67 Under future without-project conditions, no significant changes are anticipated for the White River or adjacent woodland corridor that would impact the bald eagle. Therefore, the status of the bald eagle in the study area should remain similar to existing conditions over the 50-year project life of this study.

ARKANSAS SPECIES OF SPECIAL CONCERN

5.68 Arkansas lists 16 species of special concern that are known to inhabit the project area. Of these, 11 species (six plant, two reptilian, two avian, and one insect species) are considered inventory elements. The Arkansas Natural Heritage Commission is currently conducting inventory work on these species to determine their state status. Sand cherry (*Prunus pumila*), prairie evening primrose (*Oenothera pilosella* var. *sessilis*), and pineywoods dropseed (*Sporobolus junceus*) are state

threatened plant species that occupy the project area. A sedge (no common name), *Carex bicknellii* var. *opaca*, and slender marsh pink (*Sabatia campanulata*) are state endangered plant species that occur within the project area.

RECREATION

5.69 The two major recreational activities within the study area are hunting and fishing. The Grand Prairie is renowned for providing exceptional waterfowl hunting. U.S. Fish and Wildlife Service and AGFC waterfowl biologists estimate that approximately 17,400 acres of cropland in the 362,662-acre project area are currently being flooded and managed for waterfowl each winter. Based on AGFC waterfowl harvest data for the project area counties and information contained in Gamble (1994), it was estimated that 13,746 man-days are annually spent waterfowl hunting in the project area. It was calculated, according to the Unit Day Value method described in Engineering Regulation 1105-2-100 and Corps Economic Guidance Memorandum 97-3, that each waterfowl hunting man-day is valued at \$29.92; therefore, it is estimated that approximately \$411,280 are expended annually on waterfowl hunting within the project area. Man-day and economic estimates for other recreational activities were not calculated due to a lack of site specific information.

5.70 Although man-day usage and economic values for other recreational activities cannot be quantified, other forms of recreation in addition to waterfowl hunting are popular within the study area. White-tailed deer, turkey, and squirrel hunting are extremely popular, particularly within Wattensaw WMA, the White River NWR, Cache River NWR, and other large corridors or blocks of woodlands. Although fishing is limited in most of the project area tributary streams, Peckerwood Lake, the White River and associated oxbow lakes, numerous multi-purpose reservoirs, and larger irrigation canals offer moderate to excellent fishing. Fishing access is limited on reservoirs and canals since they are privately owned. Peckerwood Lake is privately owned, but is open to the public.

5.71 The uplands, wetlands, and waters of the study area furnish non-consumptive recreationists with opportunities to participate in bird watching, nature photography, hiking, boating, and other activities. According to Craig Uyeda (pers. comm.), bird watching and boating are probably the most popular non-consumptive recreational activities in the study area.

5.72 Under future without-project conditions, Wattensaw WMA and both refuges will likely enlarge, thereby increasing public opportunities to participate in hunting, fishing, and non-consumptive recreational activities. Recreational opportunities on privately owned lands will probably remain similar to existing conditions over the next 50 years.

AGRICULTURAL LANDS

5.73 Agricultural lands comprise approximately 70% (254,406 acres) of the project area and are of major economic significance. Project area farmland contains approximately 247,556 acres of cropland, 4,571 acres of hay fields and pastureland, and 2,279 acres of Conservation Reserve

Program lands. Currently approximately 87,833 acres of rice, 89,978 acres of early soybeans, 56,909 acres of late soybeans double cropped with wheat, 7,238 acres of grain sorghum, and 5,598 acres of corn are being cultivated in the project area. All of this cropland acreage is presently being irrigated. Also, approximately 3,070 acres are now in aquaculture (i.e., catfish and bait fish ponds).

5.74 In the absence of federal action, it is anticipated that crop production will increase over the next 50 years as new technologies, crop varieties, and production practices are developed and adopted by area farmers. However, only 19,853 acres of rice, 18,337 acres of early soybeans, 12,863 acres of soybeans/wheat (double cropped), 1,636 acres of grain sorghum, and 1,265 acres of corn will be irrigated by the year 2015 due to the continued depletion of the alluvial aquifer. At year 2015 and beyond, the remaining 184,753 acres of cropland will be farmed without irrigation--130,772 acres of early soybeans, 44,046 acres of soybeans/wheat, 5,602 acres of grain sorghum, 4,333 acres of corn. The annual net return above production costs for these crops is approximately \$30,294,000 over the 50-year project life of this study. By 2015, the amount of acreage in aquaculture will be reduced to 694 acres; the average annual net return is estimated at \$3,181,000 over the next 50 years.

NAVIGATION

5.75 Commodity movements into and out of the White River were examined during this study. Barge traffic between White River ports only occurs at or upstream of DeValls Bluff. Tonnage moving between White River ports but not into and out of the White River was excluded from this analysis since the proposed project only affects the White River from DeValls Bluff downstream.

5.76 At present, commodity traffic consists of approximately 120,000 tons of receipts and 544,000 tons of shipments valued at \$27,360,000 and \$91,952,000, respectively. Fertilizer and fertilizer materials comprise approximately 75% (90,000 tons) of the receipts, and waterway improvement materials (e.g., limestone riprap) and sand and gravel constitute the remaining 25% (30,000 tons). Shipments include 332,000 tons of soybeans (61%), 185,000 tons of wheat (34%), and 27,000 tons of grain sorghum (5%).

5.77 It is anticipated that agricultural commodities production and the use of agricultural production inputs will increase over the next 50 years as new technologies, crop varieties, and production practices are developed and adopted by area farmers. Therefore, movements of all commodities are projected to increase with the exception of waterway improvement materials which will remain constant. Total movements are projected to increase by 98% by the year 2056. This increase represents an annual economic gain of \$1,857,000.

CULTURAL RESOURCES

5.78 A cultural resources survey was conducted within the project rights-of-way of proposed pipelines, canals, and pump station/inlet channel (see Appendix C, Section VIII). However, some relatively small portions of the rights-of-way were not surveyed because current landowners denied access. Approximately 11,000 acres were surveyed, and 174 historic and prehistoric sites were

discovered. Sites range in age from possible Paleo (9500 B.C. - 7800 B.C.) to present. No changes to cultural resources sites within the project area are expected under future without project conditions.

Section 122 Items

5.79 The following items are not considered to be significant resources. However, legal requirements of Section 122, 1970 River and Harbors Act, Public Law 91-116, necessitate addressing the impacts of each proposed plan upon these items. The succeeding paragraphs identify these items and briefly explain how they relate to the project-affected area.

NOISE

5.80 The study area is relatively noise free due to its rural setting. Exceptions to this are noises associated with outdoor recreation (e.g., hunting, fishing) and agricultural activities. At times, even in remote parts of the study area, noise levels may be high as a result of these activities. Under future without-project conditions, noise associated with outdoor recreational activities should increase slightly due to the probable expansions of Wattensaw WMA and the federal refuges. Agricultural noise should remain similar to existing conditions.

AIR QUALITY

5.81 The air quality in Arkansas for all criteria pollutants for the 1993-95 period was better than the National Ambient Air Quality Standards at all monitoring sites; with the exception of ozone, the measured concentrations were far below that allowed by the standards (John Mitchell, Arkansas Department of Pollution Control and Ecology, pers. comm.).

5.82 Due to its rural setting, air quality within the study area is good to above average. Temporary exceptions to this occur briefly when crop stubble is burned. Air quality is not expected to change under future without-project conditions.

AESTHETIC VALUE

5.83 The aesthetic value of the study area is closely associated with the area's natural beauty. The study area contains a diverse and aesthetically pleasing flora. The area offers a variety of natural wetlands (such as forested swamps and bottomland hardwood forests), upland forests, and tallgrass prairie remnants. There could be an increase in aesthetic value under future without-project conditions if cleared land is acquired and reforested as part of the expansions of Wattensaw WMA and the White River and Cache River NWRs.

DISPLACEMENT OF PEOPLE

5.84 Alternative plan impacts as they relate to the displacement of people are concerned with the direct and indirect consequences of plan implementation on areas of existing habitation. An example of a direct plan impact would be those persons forced to move because they inhabit lands required for project construction. An example of an indirect impact would be individuals compelled to move as a result of the decline in agriculture's profitability and its accompanying loss of jobs as the area's aquifer is depleted and irrigation cannot be sustained. Under future without-project conditions, many of the area's residents could be displaced due to loss of jobs associated with a significant reduction of the area's income when the area's aquifer can no longer support widespread irrigation practices.

COMMUNITY COHESION

5.85 The cultural heritage of the project area is linked directly to a rural way of life based on agriculture. The preservation of this lifestyle is based on the continued existence of the small farm and activities which support an agricultural based economy. Under future conditions, there will be a gradual conversion of some small farms to larger farm complexes, but the base economy of the area will remain dependent on agriculture.

LOCAL GOVERNMENT FINANCE, TAX REVENUES, AND PROPERTY VALUES

5.86 The area of local government finance is concerned with items such as tax base, property values, and tax revenues. Each of these, and other items, are important because they impact the financial condition of local government units. Financial soundness is important because it often determines the level and quality of the necessary public services provided by local governments. Under future without-project conditions, there will be a significant decrease in property values on cropland and a corresponding drop in tax revenue as the area's lands can no longer support irrigation practices due to the loss in irrigation capacity of the area's alluvial aquifer.

DISPLACEMENT OF BUSINESSES AND FARMS

5.87 Alternative plan impacts as they relate to the displacement of businesses and farms are concerned with the direct and indirect consequences of plan implementation. An example of a direct impact will be those forced to move because they are located on land required for project construction. An example of an indirect impact will be businesses or farms compelled to leave as a result of the loss in area income as the area's aquifer is depleted and irrigation cannot be sustained. Under future without-project conditions, many of the area's businesses and farms could be displaced when the area's aquifer can no longer support widespread irrigation practices.

PUBLIC SERVICES AND FACILITIES

5.88 The area of public services and facilities is concerned with the ability of local government to provide the basic public services; e.g., education, police protection, and roads and bridges. Under

future without-project conditions, the ability to provide such services will be greatly hindered. The area's tax base is expected to be greatly decreased when the alluvial aquifer is depleted causing a sharp drop in property values. This will cause a corresponding drop in tax revenues needed to provide these services.

COMMUNITY AND REGIONAL GROWTH

5.89 Growth in the communities within the project area is directly related to agriculture and agriculture related production. Agricultural production is expected to decrease significantly under future without-project conditions when the alluvial aquifer can no longer support irrigation. The drop in the value of this production will mean significant declines in the region's economy with an accompanying decrease in urban and rural population.

EMPLOYMENT

5.90 The area's employment is concentrated in trade, manufacturing, and agriculture. Under future without-project conditions, there will be a significant decrease in agriculture and agriculture related employment as a result of the decline in agriculture's profitability and its accompanying reduction in income as the area's aquifer is depleted and irrigation cannot be sustained. There will also be a significant reduction in employment not directly associated with agriculture due to the secondary effects of the loss in agricultural income to the area's economy.

6. ENVIRONMENTAL CONSEQUENCES

6.1 This section describes the effects of each detailed plan on the previously discussed significant resources and serves as the source of information for Table 4-1, Comparative Impacts of Alternatives, in Section 4. It is important to note that the dynamic nature of the study area and necessity of long-range projections made quantitative assessment of project impacts difficult, often impossible. In cases where impacts could not be assessed quantitatively, qualitative assessments were made based on available information and professional judgement.

Significant Resources

RIVERS AND STREAMS

Alternative 7B (1,640 CFS Import System) - Selected plan

6.2 Project-induced impacts to the White River would be confined within the reach from Interstate 40 (mile 126.6) downstream to St. Charles (mile 57.0). Maximum stage reductions would occur during summer/early fall when the river is low and irrigation demands are highest; the maximum stage reduction, compared to existing conditions, would be approximately one foot or less during this period. However, it is important to note that daily variability in river stages is greater than predicted project changes in river stages. Changes in stage are almost immeasurable during high-flow periods.

6.3 This plan has a delivery system that would utilize the existing tributary streams to distribute irrigation water. Supplemental water would be provided to the tributary streams, and pools would be maintained within these streams through the installation of numerous weirs. Minimum pool elevations would be maintained even during periods of water shortfall (i.e., irrigation demand exceeds water supply capability) in order to protect aquatic resources and ensure efficient operation of the irrigation system. This plan would benefit fisheries within the tributary streams (see Appendix C, Section V).

Alternative 7A (1,480 CFS Import System)

6.4 Impacts to the White River are similar to Alternative 7B. Although the impacts to the White River vary slightly with the capacity of the import system, the relative differences hydrologically among the four import system alternatives are minor and the general trend is the same. Impacts to the tributary streams are also very similar to Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.5 Impacts of this plan would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.6 Impacts of this plan would be similar to Alternative 7B.

GROUNDWATER

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.7 At year 2015 and beyond, annual withdrawals from the aquifer would be limited to the long-term sustained yield (35,574 acre-feet) which would allow recharge. It is likely that the state of Arkansas will begin limiting annual withdrawals to the sustained yield prior to year 2015. Even without state regulation of groundwater withdrawals, the project would extend the life of the aquifer and allow for recharge during years when sufficient surface water is available to replace groundwater demands. This should allow for limited recharge and be sufficient to prevent permanent loss of the aquifer.

Alternative 7A (1,480 CFS Import System)

6.8 Impacts would be similar to Alternative 7B

Alternative 7C (1,800 CFS Import System)

6.9 Impacts would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.10 Impacts would be similar to Alternative 7B.

WATER QUALITY

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.11 Future conditions with the project in place insures that water would be available for irrigation purposes and that there would be no significant changes in farming practices. Because water from the White River would be used in the delivery system, it was necessary to analyze the water quality of the White River in order to determine impacts, if any, to farmland and receiving streams. A detailed description of the sediment analysis and results are contained in the document "Sediment Transport" which is found in Appendix B, Section I, Hydraulics and Hydrology. It is predicted that all of the canals would receive some sediment deposition. However, most of the imported sediment would be dropped in the inlet channel. For these reasons, there would be no detectable sediment drop in receiving streams.

6.12 In addition to the above Corps sediment analysis, the Ground Water Institute at the University

of Memphis, led by Dr. John Smith, conducted studies during 1996 to determine the current water quality of area streams, reservoirs, wells, and tailwater recovery systems. This report is found in Appendix C, Section III. Conclusions from this study showed that replacing irrigation well water with water diverted from the White River would have positive effects on the farmland and receiving streams. For example, the imported water would have lower hardness and alkalinity levels and slightly higher amounts of inorganics. This should increase the long-term productivity of the land and have no adverse effects on existing streams.

6.13 Measures to minimize impacts on water quality would be incorporated into project construction, and National Pollution Discharge Elimination System permits would be sought as appropriate. Construction of the pumping station inlet channel and subsequent maintenance dredging would cause short-term increases in stream turbidity within a localized section of the White River; these activities should not have significant adverse impacts on fish.

6.14 Non-point agricultural run-off would not increase over existing conditions and could be reduced because of recovery efforts. However, post-construction water quality sampling would be initiated as part of an environmental monitoring program for the project. This sampling program would include sampling stations on the main canal at turnout locations and other sites as needed.

Alternative 7A (1,480 CFS Import System)

6.15 Project effects would be similar to Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.16 Project effects would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.17 Project effects would be similar to Alternative 7B.

AQUATIC RESOURCES

Alternative 7B (1,640 CFS Import System)- Selected Plan

6.18 Project impacts on aquatic resources were addressed in the U.S. Army Waterways Experiment Station (WES) report, *Effects of Grand Prairie Irrigation Project on Fishes of the White River and Tributaries* (see Appendix C, Section V). Generally, the Selected plan is projected to produce positive impacts on project area aquatic resources. This alternative would create 184 miles of new canals resulting in 8,560 fish habitat units (HUs) per month (one HU equals one acre-foot of prime fish habitat). Development of the water delivery system would involve creation of 120 weirs in tributary streams. Additional water from the White River and the pooling effect of the weirs would increase wetted area and habitat quality for fish because all of these streams have been

previously channelized and, generally, flows are extremely low during the summer months. The WES study projected an increase of 4,328 fish HUs per month over existing conditions for project area streams. Streams that would have the greatest gains in HUs include Little LaGrue Bayou, LaGrue Bayou, Mill Bayou, Honey Creek, Clearpoint Creek, and Elm Prong Mill Bayou. In addition to gains associated with new canals and existing streams, it is also projected that 8,849 new acres of irrigation reservoirs would be created on existing farmland, and this would further enhance project area fishery resources.

6.19 Potential adverse impacts on aquatic resources are associated with pump entrainment of larval fishes, stage reductions in the White River that could impact littoral habitat and connectivity of oxbow lakes, and blockage of migratory pathways by construction of in-stream weirs. The WES report indicated that these potential adverse impacts would be minimal. Velocities in the pump station intake canal would range from approximately 0.2 feet/second when the river stage is near top bank to 1 feet/second at lower stages. Larval fish drifting in the water column along the west bank of the White River could potentially be drawn towards the pump intake. Entrained larvae would suffer immediate mortality or eventually die in the receiving streams and canals; entrainment potential is greatest during summer months. For the Selected plan, no entrainment is projected for seven months of the year. During the spring and summer months, entrainment is projected to range from 1.2% of larval fish during May up to 12.4% in July for larval fish in water under the effect of pumping. The WES study indicated that the loss is considered to be minor when considering the total numbers of larval fish that exist cumulatively in inlets and other backwaters of the White River. However, in conjunction with the U.S. Fish and Wildlife Service (USFWS) and Arkansas Game and Fish Commission, a post-construction monitoring program will be designed and implemented in order to more accurately estimate entrainment of larval fishes.

6.20 The WES study investigated 16 oxbow lakes that are either seasonally or permanently connected to the White River so that fish may pass from one area to the other. Eight of the lakes are permanently connected at median monthly discharges. Natural variability in the hydrograph confounds predictions of connectivity and minimum depth suitable for fish passage in four seasonally connected oxbow lakes; however, the Arkansas State Water Plan would prohibit pumping at low flows (75% exceedance value) so connectivity of lakes should not be effected during the critical summer and fall months. Also, pumping under the most adverse conditions would not effect White River stages by more than one foot, so impacts on littoral area habitat for fish and invertebrates of the White River in the vicinity of the pump canal are considered to be minimal (reductions in HUs were less than 3% for any pump alternative).

6.21 There was some initial concern that weirs in project area streams could impact upstream and downstream movement of fishes; thus impacting the ability of some species to make migratory spawning runs necessary to the viability of the population. However, the WES study found that dominant taxa of fishes of the tributary streams are not large, migratory species; but small habitat generalists that exhibit only localized movement. This is due primarily to small stream size and the presence of two dams in lower LaGrue Bayou that prevent upstream movement. It should also be pointed out that the proposed weirs would not totally prevent localized movement of fishes because

predicted maximum water depths would be one to four feet above the crest elevation of the weirs.

6.22 In summary, the WES study indicated that potential adverse impacts of the Selected plan are considered to be minimal, whereas potential aquatic gains from construction of weirs and creation of canals and storage reservoirs are considered to be substantial.

6.23 Other concerns were related to the potential impact of water withdrawals on mussels in the White River and adjacent oxbow lakes and the potential impact that introducing zebra mussels from the White River to the tributary streams would have on native mussels. The minor reductions in surface water elevations of the White River should not cause significant adverse impacts on mussels since mussel beds in the White do not occur at depths less than approximately 10 feet below the water surface at low water (Dr. John L. Harris, pers. comm.), and this plan would not impact connectivity of oxbow lakes. A reconnaissance mussel survey conducted by the USFWS indicates that mussels are relatively scarce in the tributary streams. Furthermore, if zebra mussels become prolific in the White River, the introduction of zebra mussels into the smaller project area streams is inevitable (Dr. Andrew Miller, WES, pers. comm.). The overall effects of the project on mussels within tributary streams should be positive since additional water would be supplied to these streams.

Alternative 7A (1,480 CFS Import System)

6.24 Impacts of this alternative are similar to the Selected plan. As with the Selected plan, no measurable entrainment is predicted for a seven month period. During the time when entrainment is most likely, it ranges from a low of 1.1 percent in May to a high of 11.4 percent in July.

Alternative 7C (1,800 CFS Import System)

6.25 Entrainment during critical months ranges from 1.3 to 13.3 percent. Otherwise, this alternative is similar to above.

Alternative 7D (1,960 CFS Import System)

6.26 Similar to above. Entrainment ranges from 1.3 to 14.1 percent.

BOTTOMLAND HARDWOOD FOREST

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.27 The project area currently contains approximately 19,931 acres of bottomland hardwood forest (includes forested swamp). Under future without-project conditions, the amount of bottomland hardwood forest could increase substantially within the study area due to probable cleared land acquisitions and reforestation by Wattensaw WMA and the two USFWS refuges. Under Alternative 7B, a total of 71 acres would be directly impacted by construction of water distribution

system components. Approximately 16 acres, 14 acres, and one acre would be permanently displaced by the construction of weirs, canals, and the pump station inlet channel, respectively. Approximately 40 acres would be cleared but allowed to reforest following construction. Of the 40 acres temporarily impacted, 22 acres would be cleared for weir construction and 18 acres would be cleared for pipeline placement. Two hundred forty-three acres of cleared agricultural wetlands would be acquired and planted in selected bottomland hardwood trees to mitigate losses to bottomland hardwoods and other wetlands (see Appendix C, Section II).

6.28 A multi-agency team led by the Arkansas Natural Heritage Commission and the Natural Resources Conservation Service, with participation by the Arkansas Game and Fish Commission, U.S. Fish and Wildlife Service, Memphis District Corps of Engineers, and Arkansas Highway and Transportation Department, conducted a study to evaluate the impacts of water withdrawals from the White River on wetlands and bottomland hardwood forest communities within the floodplain. The study was conducted on the floodplain west of Clarendon, Arkansas, just south of Arkansas Hwy. 79. This site was chosen because of extensive gage data at Clarendon and because the lands involved are part of the White River National Wildlife Refuge. Wetland zones as defined by Wharton et al. (1982) were the basic ecological units emphasized, and average river flows over 10-day intervals were the basic hydrologic units. In some cases, intervals were analyzed on a monthly basis (141 ten-day intervals per month over 47-year period of analysis) as well.

6.29 The following steps were implemented during the study: (1) vegetative data were collected at a series of plots of known elevation, (2) forest types at plots were defined using multivariate analysis, (3) wetland zones were defined using elevation ranges of forest types, (4) wetland zone elevation boundaries were correlated with river flows and stages, (5) flood frequency and duration of wetland zones were determined using hydrologic data developed by the Memphis District, and (6) the percentage of time flows within a given wetland zone would fall to a lower zone as a result of this alternative was projected. It is assumed that impacts of water withdrawals would occur when water levels drop to a lower zone; if water levels remain within the same zone, it is assumed that vegetation within that zone can adapt to any minor changes in water elevation. The following zones and associated plant communities were defined: Zone 1 (permanently inundated) - open water; Zone 2 (intermittently exposed) - black willow, water elm-water tupelo-bald cypress, and bald cypress-water hickory; Zone 3 (semipermanently inundated) - overcup oak-water hickory; Zone 4 (seasonally inundated or saturated) - overcup oak-Nuttall oak, sugarberry-green ash-American elm; and Zone 5 (temporarily inundated or saturated) - willow oak-green ash-cedar elm.

6.30 Under existing conditions, parts or all of Zones 4 and 5 are flooded frequently from December through June and occasionally during other months. All or parts of Zones 2 and 3 are flooded frequently in most months, with lowest frequency of flooding in October. Under Alternative 7B, some impacts are projected to occur from March through September. In most cases, the amount of time flow is lowered below any given wetland zone boundary is projected to be 10% or less, indicating minimal impacts. However, Zone 4 flows would be reduced to Zone 3 levels 37% (11 of 30 ten-day intervals) of the time in July, 40% (6 of 15 intervals) of the time in August, and 18% (2 of 11 intervals) in September. Maximum impact during a 10-day interval would occur in the 1-10

July interval, when 50 % (7 of 14) of Zone 4 flows in the 47-year period of record would be reduced to Zone 3 flows. There would be an even greater percentage impact in the 1-10 August interval when 75% (6 of 8) of the Zone 4 flows would drop to Zone 3.

6.31 Although these reductions are significant, they raise questions as to the “naturalness” of existing flows of Zone 4 magnitude during mid-summer; these high flows apparently result from attempts to release water gradually from upstream reservoirs during wet years. Indeed, comparison of the “existing conditions” flows with a “no reservoirs” hydrologic model shows that Zone 4 flows during the 1-10 July interval would have occurred 6 times over the 47-year period of record (13%) under conditions without reservoirs, as compared to 14 times (30% of the time) under present reservoir release rules (existing conditions). Over the entire month of July, Zone 4 flows would have occurred 13 of the 141 ten-day intervals (9%) without reservoirs and 30 intervals (21%) under existing conditions. Similarly, in the 1-10 August interval, Zone 4 flows would have occurred once during the 47 years (2%) under the without- reservoirs condition as compared to 8 times (17%) under existing conditions. Comparable frequencies for the entire month of August would be 2 of 141 intervals (1.3%) without reservoirs and 15 intervals (11%) under current reservoir management rules.

6.32 There are some impacts associated with Alternative 7B, even considering conditions without reservoirs. For example, in 8 of 47 years (17%), flows in any zone under existing conditions that were higher than under without-reservoirs conditions would have been reduced under Alternative 7B below the without-reservoirs flows during the 1-10 July interval. However, only one additional instance would have occurred in the other intervals of the month for a total of 9 of 141 (6%) over the entire month of July. During the 1-10 August interval, 3 of 47 (6%) flows in all zones would have been reduced; and 4 of 141 (3%) would have been reduced over the entire month of August. A very few flows under project conditions would have been reduced to a lower zone than the equivalent flow under conditions without reservoirs; a total of 4 instances of this would have occurred out of 1,692.

6.33 Using the same approach (project conditions compared to existing conditions), impact of flow reductions on a connecting channel between the river and wetlands in the study area was analyzed and determined to be minimal (10% maximum during 1- 10 July; 4% maximum over the month of June).

6.34 Based on this analysis, water withdrawals associated with alternative 7B may be expected to have impacts on Zone 3 and 4 plant communities in July and August relative to current conditions, particularly in the 1-10 July and 1-10 August intervals. Reductions of flows from the higher to lower zone approximately 40% of the time over this two-month period could cause instability of vegetation at the zone boundary, allowing higher-zone vegetation to move down slope, replacing vegetation of the lower zone. However, in this case the effects of the plan are counterbalanced to a substantial degree by the operation of upstream reservoirs. Flows under project withdrawal conditions are seldom reduced below without-reservoirs conditions, and almost never reduced to a lower zone. Flows under project withdrawal conditions appear to better approximate the "natural" or without-

reservoirs condition than do current release rules. Whether this is to be considered "good" or not is a matter of judgement. One point to consider is that if plant communities are adapted to a specific hydrologic regime, any change, even to a more "natural" regime, could cause instability. This does not appear to be the case in the White River bottomlands because reservoir operations have changed over time. Therefore, vegetation is adjusting to on-going changes; and the lowering of high water levels in late summer should have more beneficial than adverse impact.

6.35 According to Waldron and Anderson (1995), distances from the ground surface of White River floodplain wetlands to the water surface in the alluvial aquifer would continue to increase in the northern section of the Grand Prairie region. However, the aquifer would likely rebound in the southern section of the Grand Prairie, lessening the distance from the aquifer water surface to the wetlands. Therefore, this plan could possibly prevent or slow the desiccation of groundwater wetlands along the White River.

Alternative 7A (1,480 CFS Import System)

6.36 Construction impacts to bottomland hardwoods and associated mitigation requirements would be the same as Alternative 7B, and project influences on wetlands along the White River would be similar.

Alternative 7C (1,800 CFS Import System)

6.37 Construction impacts and mitigation would be the same as Alternative 7B, and project influences on wetlands along the White River would be similar.

Alternative 7D (1,960 CFS Import System)

6.38 Construction impacts and mitigation would be the same as Alternative 7B, and project impacts on wetlands along the White River would be similar.

UPLAND HARDWOOD FOREST

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.39 Approximately 14,940 acres of upland hardwood forest are contained within the project area. Construction of the water distribution system would adversely impact approximately 124 acres. Fifty-nine acres would be lost permanently, and 65 acres would be cleared for construction but not permanently impacted. Permanent losses would be associated with the construction of weirs (five acres), the major pipelines that connect the pumping station and main canal (eight acres), the pumping station (five acres), and canals (41 acres). Temporary impacts to upland hardwoods would result from weir (10 acres) and pipeline (55 acres) construction. Of the 65 acres temporarily affected, 28 acres in and bordering Wattensaw WMA would be replanted in selected upland hardwood tree species; and the remaining 37 acres would be allowed to regenerate naturally. In

order to offset project-induced losses to upland hardwoods, 193 acres of cleared land would be acquired and planted in selected upland hardwood trees. It is assumed that all on-farm irrigation reservoirs and conservation features would be constructed on agricultural lands.

Alternative 7A (1,480 CFS Import System)

6.40 Impacts and mitigation would be the same as Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.41 Impacts and mitigation would be the same as Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.42 Impacts and mitigation would be the same as Alternative 7B.

WETLANDS

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.43 Construction of the water distribution system would result in the loss of approximately 128 acres of “natural” and farmed wetlands. Ten acres of bottomland hardwoods, five acres of forested swamp, 23 acres of scrub/shrub swamp, and one acre of marsh would be lost to canal construction; and 14 acres of bottomland hardwoods, two acres of forested swamp, seven acres of scrub/shrub swamp, and two acres of marsh would be destroyed by weir construction. Sixty-four acres of farmed wetlands would be lost to pump station and canal construction. In addition, 57 acres of wetlands (35 acres of bottomland hardwoods, five of acres forested swamp, 17 of acres of scrub/shrub swamp) would be temporarily impacted by project construction; these wetlands would be allowed to regenerate following project construction. These temporary impacts would be associated with pipeline (26 acres) and weir (31 acres) construction. Two hundred forty-three acres of cleared agricultural wetlands would be acquired and planted in bottomland hardwood trees to mitigate impacts to wetlands. It is unlikely that withdrawals from the White River could adversely impact floodplain wetlands (see BOTTOMLAND HARDWOOD FOREST, EIS-67 - EIS-70). Moreover, desiccation of groundwater wetlands along the White River within the southern portion of the Grand Prairie could be halted or slowed through implementation of this alternative.

6.44 The Section 404(b)(1) evaluation is presented in Appendix C, Section IV. This evaluation covers only the water import system; it does not cover on-farm project features (i.e., on-farm water distribution system, irrigation reservoirs, tailwater recovery systems). A farmer would have to apply for and obtain an individual Section 404(b)(1) permit from the Corps of Engineers in order to construct an on-farm feature in a wetland. The Natural Resources Conservation Service estimates that approximately 200 acres of farmed wetlands would be lost to construction of on-farm features. Approximately 200 acres of farmed wetlands or prior converted farmland would have to be acquired

and restored to bottomland hardwoods to mitigate this impact. It is important to note that these are only estimates of the on-farm impacts and subsequent compensatory mitigation. The actual impacts and required mitigation would be determined as each on-farm plan is completed. The project sponsor would acquire mitigation land for on-farm wetland losses in manageable tracts. Mitigation land acquisition would proceed at the same rate as construction of on-farm features.

Alternative 7A (1,480 CFS Import System)

6.45 Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.

Alternative 7C (1,800 CFS Import System)

6.46 Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.

Alternative 7D (1,960 CFS Import System)

6.47 Construction impacts and mitigation would be the same as Alternative 7B, and effects on White River floodplain wetlands would be similar.

PRAIRIE

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.48 Although efforts were made to avoid locating irrigation canals and pipelines in existing prairie remnants, this alternative would impact native prairie at three locations (see Appendix C, Section VII, Maps 1-B and 3-B). Canal 1000 will cross the ANHC Railroad Prairie Natural Area approximately 2.3 miles west of DeValls Bluff, Arkansas; this canal cannot be relocated due to topography. Canal 3200 would cross the Railroad Prairie approximately 2.0 miles west of Hazen, Arkansas; however, adverse impacts to the prairie will be minimal at this locale because Canal 3200 would be routed primarily through a highly disturbed portion of the old railroad right-of-way and would diagonally cross Highway 70. Also, Canal 4500 would traverse the privately owned Fairmount Prairie. No more than four acres of prairie would be lost as a result of this alternative.

6.49 Furthermore, native prairie grasses (i.e., big bluestem, little bluestem, switchgrass, Indiangrass), and possibly some prairie forbs, would be planted in the irrigation canal rights-of-way. These rights-of-way would afford an area of approximately 3,000 acres for the potential establishment of native prairie vegetation. Since prairie restoration can be costly and time consuming, experimental plantings of these grasses must be conducted to determine the appropriate planting methodology and associated costs. The results of this experimentation would be used to ascertain the actual acreage that could be planted in prairie grasses.

Alternative 7A (1,480 CFS Import System)

6.50 Prairie impacts and benefits would be the same as Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.51 Prairie impacts and benefits would be the same as Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.52 Prairie impacts and benefits would be the same as Alternative 7B.

WILDLIFE

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.53 As a waterfowl management component of alternatives 7A, 7B, 7C, and 7D, harvested rice fields would be flooded annually from 1 November through 28 February to provide additional forage and resting habitat for waterfowl. In order to measure the benefit, duck-use-days (DUDs) were calculated according to Nelms (in prep.). A DUD is defined as the capacity of available forage to meet the energy needs of one duck for one day; it was determined that harvested rice fields provide 581 DUDs per acre. With Alternative 7B, 38,529 acres of harvested rice fields would be flooded on an average annual basis; this would annually provide 22,385,349 DUDs. It is estimated that the project area would annually provide approximately 10,109,400 DUDs (17,400 acres of cropland flooded) under future without-project conditions. Therefore, Alternative 7B would provide an additional 12,275,949 DUDs per year. In addition, the construction of 8,849 acres of reservoirs would provide some additional benefits to waterfowl; the benefits afforded waterfowl as a result of the reservoirs would be relatively minor in comparison to the benefits derived from flooding the rice fields. Shore birds would also benefit from the flooded crop fields and additional reservoirs. Additional shore bird foraging habitat could be provided if the reservoirs would be constructed with gently sloping sides; this would expose additional mudflats during reservoir drawdowns. In fact, the Natural Resources Conservation Service (NRCS), in conjunction with the Arkansas Game and Fish Commission, has developed a general design for a sloped reservoir. In comparison to a standard reservoir of equal volume, the sloped design would not displace additional land. The NRCS would promote the sloped-sided reservoir design to area farmers. Also, wetland dependent wildlife species could benefit from this plan since it would likely halt or slow desiccation of groundwater wetlands along the White River.

6.54 Approximately 118 acres of valuable wildlife habitat would be permanently destroyed as a result of this plan. In addition, approximately 127 acres would be temporarily impacted as a result of vegetative clearing for construction purposes. Table 6-1 shows the habitats impacted and the acres of each habitat under future with- and without-project conditions.

TABLE 6-1
WILDLIFE HABITAT ACREAGE AVAILABLE BY YEAR 2056

Habitat	Future Without Project	Alternative 7B
Upland Hardwoods	14,940	14,816
Regenerating Upland Hardwoods	0	65
Bottomland Hardwoods	15,860	15,801
Regenerating Bottomland Hardwoods	0	35
Forested Swamp	4,071	4,059
Regenerating Forested Swamp	0	5
Scrub/Shrub Swamp	6,987	6,940
Regenerating Scrub/Shrub Swamp	0	17
Marsh	1,370	1,367
Regenerating Hardwoods (Weir Spoil)	0	28

6.55 The Habitat Evaluation System (HES), U.S. Army Corps of Engineers (1980), was employed to calculate habitat quality indices (HQIs) for significant wildlife habitat types in the project area. The HQIs were determined for existing conditions and projected for future conditions. A habitat unit value (HUV) was calculated, as a product of habitat quantity and HQI, for each habitat type. Annualized HUVs were used to indicate net habitat losses or gains for each habitat type. Table 6-2 displays annualized HUVs of each habitat type impacted by Alternative 7B for future with- and without-project conditions. A more detailed presentation of the HES analysis is contained in Appendix C, Section I.

TABLE 6-2
AVERAGE ANNUAL HABITAT UNITS AVAILABLE
FOR EACH HABITAT TYPE

Habitat	Future Without Project	Alternative 7B
Upland Hardwoods	11,653	11,566
Regenerating Upland Hardwoods	0	30
Bottomland Hardwoods	12,688	12,646
Regenerating Bottomland Hardwoods	0	16
Forested Swamp	2,850	2,842
Regenerating Forested Swamp	0	2
Scrub/Shrub Swamp	5,380	5,347
Regenerating Scrub/Shrub Swamp	0	8
Marsh	712	711
Regenerating Hardwoods (Weir Spoil)	0	11
Total	33,283	33,179

6.56 Annualized HUV losses would occur in upland hardwood forest, bottomland hardwood forest, forested swamp, scrub/shrub swamp, and marsh. Some of the losses would be partially regained through vegetative regeneration within portions of the rights-of-way. For example, construction of pipelines (excluding 1000P) represents only temporary impacts to wildlife habitat; following pipeline placement, the rights-of-way would be allowed to revegetate. Also, hardwood regeneration would occur on spoil piles and cleared portions of rights-of-way associated with weir construction. However, a total loss of 104 annualized HUVs would occur as a result of Alternative 7B; 436 acres of cleared land would be acquired and reforested to mitigate this loss of annualized HUVs (see Appendix C, Section II).

Alternative 7A (1,480 CFS Import System)

6.57 Construction impacts and mitigation would be the same as Alternative 7B. Benefits to wildlife would be similar; however, 38,234 acres of harvested rice fields would be flooded for waterfowl each year. This would provide 22,213,954 DUDs annually.

Alternative 7C (1,800 CFS Import System)

6.58 Construction impacts and mitigation would be the same as Alternative 7B. Benefits would be similar to Alternative 7B except that 38,766 acres of harvested rice fields would be flooded; this would provide 22,523,046 DUDs.

Alternative 7D (1,960 CFS Import System)

6.59 Construction impacts and mitigation would be same as Alternative 7B. Benefits would be similar except that 39,128 acres of harvested rice fields would be flooded, providing 22,733,368 DUDs

STATE AND FEDERAL HOLDINGS

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.60 The Selected plan would not impact the Stuttgart National Aquaculture Research Center (SNARC) or the Rice Research and Extension Center (RREC). However, construction of pipeline 1000P would impact approximately 30 acres of upland hardwood forest within the southern boundary of Wattensaw WMA. Of the impacted acreage, 6.5 acres would be permanently lost and an additional 23.5 acres would be cleared for construction purposes; the 23.5 acres would be replanted in selected upland hardwood trees. Canals 1000 and 3200 would impact the Railroad Prairie Natural Area at two locations (see Appendix C, Section VII, Maps 1-B and 3-B); approximately two acres of this natural area would be lost due to construction of the canals. Land and Water Conservation Act Funds were used to purchase the Railroad Prairie Natural Area; therefore, the Memphis District is coordinating (through the Arkansas Natural Heritage Commission and Arkansas Department of Parks and Tourism) property conversion approval and selection of suitable replacement property with the National Park Service. The White River floodplain wetlands within the two federal refuges should not be adversely impacted by this plan (see BOTTOMLAND HARDWOOD FOREST, EIS-67 - EIS-70).

Alternative 7A (1,480 CFS Import System)

6.61 Impacts to the SNARC, RREC, Wattensaw WMA, and Railroad Prairie Natural Area would be the same as Alternative 7B. Project effects on White River floodplain wetlands within the refuges would be similar to Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.62 Impacts to the SNARC, RREC, Wattensaw WMA, and Railroad Prairie Natural Area would be the same as Alternative 7B. Project effects on White River floodplain wetlands within the refuges would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.63 Impacts to the SNARC, RREC, Wattensaw WMA, and Railroad Prairie Natural Area would be the same as Alternative 7B. Project effects on White River floodplain wetlands within the refuges would be similar to Alternative 7B.

ENDANGERED AND THREATENED SPECIES

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.64 This alternative should not adversely impact the pallid sturgeon. Pallid sturgeon rarely inhabit areas other than main channels of turbid rivers; therefore, slight reductions in surface water elevations would not impact this fish. The U.S. Fish and Wildlife Service (USFWS) concurs with this determination of no adverse impacts.

6.65 The pink mucket pearly mussel does not occur at depths less than approximately 10 feet below the water surface at low water; therefore, no adverse impacts to this mussel should occur as a result of water withdrawals (Dr. John L. Harris, pers. comm.). Pink mucket pearly mussels have been found above and below the pump station inlet channel. Prior to construction of the inlet channel, mussels would be removed from the portion of the White River within the construction impact zone and released in other areas of the river with suitable habitat. At the request of the USFWS, a separate biological assessment is being prepared for the pink mucket pearly mussel. We do not anticipate any problems in relocating this species to a satisfactory alternative site.

6.66 The bald eagle presently occurs within the study area primarily as a transient species. No significant impacts to fisheries within the White River and adjacent oxbow lakes are anticipated. Also, no significant tree loss would occur near the White River or the nest recently discovered approximately six miles east-southeast of Stuttgart, Arkansas. Therefore, no adverse impacts to the bald eagle are projected. The USFWS concurs with this determination of no adverse impacts.

6.67 See Volume 9, Appendix C, Section VI, Part A, for USFWS correspondence regarding endangered and threatened species.

Alternative 7A (1,480 CFS Import System)

6.68 Project effects would be similar to Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.69 Project effects would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.70 Project effects would be similar to Alternative 7B.

ARKANSAS SPECIES OF SPECIAL CONCERN

All Alternatives

6.71 None of the project alternatives would have significant adverse impacts on state species of special concern. Since sensitive plant species occur within existing prairie remnants, sod would be removed from all canal crossings of native prairie prior to construction and reestablished within the canal rights-of-way. These canal crossings would also be surveyed prior to sod removal, and any sensitive animal species (e.g., western chicken turtle, ornate box turtle) would be relocated. Moreover, restoration of native prairie vegetation should have a beneficial effect on many of the state species of special concern since they are indigenous to prairies.

RECREATION

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.72 The flooding of approximately 38,529 acres of harvested rice fields each winter would generate 28,769 waterfowl hunting man-days annually; it is estimated that approximately \$860,760 would be expended annually on waterfowl hunting within the project area. In comparison with future without-project conditions, this represents an annual increase of 15,023 waterfowl hunting man-days and \$449,480 in related expenditures over the 50-year project life of this study.

6.73 There is insufficient site specific data for estimating man-day and economic values for other forms of recreation. It is probable that losses in habitat value associated with construction of the water distribution system would adversely impact hunting of woodland wildlife species and some forms of non-consumptive recreation (e.g., bird watching); however, any impacts should be slight and offset by the mitigation plan (i.e., reforestation of cleared lands). See Appendix C, Section II, for a detailed description of the mitigation plan and environmental features.

6.74 The minor loss of habitat units should not significantly impact sportfishing on the White River, and oxbow lake fishing would not be impacted. Furthermore, construction of the irrigation canals and reservoirs would provide additional fishing opportunities within the project area.

Alternative 7A (1,480 CFS Import System)

6.75 Approximately 38,234 acres of harvested rice fields would be flooded annually for waterfowl, generating 28,559 recreational man-days and \$854,485 in expenditures each winter. This represents an annual increase of 14,813 man-days and \$443,205.

6.76 Impacts to other forms of recreation would be similar to Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.77 This plan would provide 38,766 acres of flooded, harvested rice fields on an average annual basis. It would furnish approximately 28,937 man-day of waterfowl hunting and \$865,802 in expenditures annually. In comparison to future without-project conditions, it is projected that Alternative 7C would increase waterfowl hunting by 15,191 man-days and associated expenditures by \$454,522 each hunting season.

6.78 Impacts to other recreational activities would be similar to Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.79 Approximately 39,128 acres of harvested rice field would be flooded on an average annual basis, supplying approximately 29,195 man-days of hunting and \$873,503 in associated expenditures per annum. This would be an annual increase of 15,449 man-days and \$462,223 in expenditures.

6.80 Impacts to non-consumptive and other consumptive recreational activities would be similar to Alternative 7B.

AGRICULTURAL LANDS

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.81 Construction of the water distribution system would result in the loss of approximately 3,795 acres of agricultural lands. Of the acreage lost, approximately 3,695 acres would be prime and unique farmland and 77 acres would be farmland of statewide and local importance (see Appendix C, Section VI, Part B). In addition, it is estimated that 8,849 acres of on-farm irrigation reservoirs would be constructed in agricultural lands; however, the exact locations of these reservoirs have not yet been determined. Although cropland would be lost as a result of this plan, the overall benefits to agriculture would overshadow the direct impacts associated with construction.

6.82 At year 2015 and beyond, 209,046 acres of cropland would be irrigated each year; this is 155,092 more acres than could be irrigated under future without-project conditions during the same time period. By the year 2015, approximately 77% (184,753 acres) of the presently irrigated cropland would be converted to dryland agriculture under future without project conditions. Only about 12% (29,661 acres) of the presently irrigated cropland would be converted to dryland agriculture under Alternative 7B. By the year 2015, only 694 acres would remain in aquaculture (i.e., catfish and bait fish farming) under future without-project conditions. However, this plan would provide an estimated 2,689 acres of aquaculture ponds. The net annual agricultural benefit (including aquaculture) provided by Alternative 7B would be \$35,659,000.

Alternative 7A (1,480 CFS Import System)

6.83 Construction impacts to agricultural land would be the same as Alternative 7B. Under Alternative 7A, approximately 205,232 acres of farmland would be irrigated at year 2015 and during subsequent years; this is an increase of 151,278 acres compared to future without project conditions. In the year 2015, the area in aquaculture ponds would represent an increase of 1,945 acres. The net annual agricultural benefit afforded by this alternative would be \$34,823,000.

Alternative 7C (1,800 CFS Import System)

6.84 Construction impacts associated with this plan would be the same as Alternative 7B. At year 2015 and beyond, approximately 213,837 acres of cropland would be irrigated; in comparison to future without-project conditions, this would be an increase of 159,883 acres. Also, the acreage in aquaculture ponds (2,750 acres) at year 2015 represents a 296% increase over future without-project conditions. Alternative 7C would furnish a net agricultural benefit of \$36,266,000.

Alternative 7D (1,960 CFS Import System)

6.85 Construction impacts to farmland would be the same as Alternative 7B. Approximately 217,391 acres of cropland would be irrigated in year 2015, an increase of 163,437 acres over future without-project conditions. The 2,796 acres of aquaculture ponds available under this plan represents a three-fold increase over future without project conditions. Alternative 7D would provide a net agricultural benefit of \$36,844,000.

NAVIGATION

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.86 Under the Selected plan, project-induced delays and diversions of commodity movements and increases in the number of light-loaded barges would result in an average annual economic loss of \$127,000. For a detailed description of navigation impacts, see Appendix D, Section II.

Alternative 7A (1,480 CFS Import System)

6.87 Navigation impacts associated with this plan would result in an average annual economic loss of \$121,000.

Alternative 7C (1,800 CFS Import System)

6.88 Alternative 7C would result in an average annual navigation loss of \$132,000.

Alternative 7D (1,960 CFS Import System)

6.89 Navigation impacts induced by Alternative 7D would result in an average annual loss of \$136,000.

CULTURAL RESOURCES

Alternative 7B (1,640 CFS Import System) - Selected Plan

6.90 Prior to project construction, any unsurveyed portions of project rights-of-way would be surveyed; and testing would be conducted to determine if any cultural resources sites are significant (i.e., eligible for nomination to the National Register of Historic Places). Any significant sites must be avoided during construction or mitigated before construction in the immediate vicinity of the sites is initiated.

6.91 The draft general reevaluation report and draft environmental impact statement were sent to the state historic preservation officer (SHPO) for review. The SHPO agreed with the decision to conduct cultural resources surveys, testing, and mitigation. The survey has been conducted and the draft cultural resources report has been reviewed by the SHPO and found to be in compliance with Section 106 of the National Historic Preservation Act, as amended. A memorandum of agreement will be written to guide the remaining cultural resources work. Coordination letters from the SHPO are contained in the front of the main report with letters received from public review.

Alternative 7A (1,480 CFS Import System)

6.92 Cultural resources requirements would be the same as Alternative 7B.

Alternative 7C (1,800 CFS Import System)

6.93 Cultural resources requirements would be the same as Alternative 7B.

Alternative 7D (1,960 CFS Import System)

6.94 Cultural resources requirements would be the same as Alternative 7B.

Section 122 Items

NOISE

All Alternatives

6.95 Noise would increase during initial construction due to equipment operation. Following construction, noise levels should return to normal over most of project area. However, noise would increase in the vicinity of the pump station during operation of the pumps. Totally electric pumps would be used instead of diesel pumps or electrical pumps powered by diesel generators; use of totally electric pumps would significantly reduce noises associated with the pump station.

AIR QUALITY

All Alternatives

6.96 Machinery emissions from mobile sources and airborne dust during construction and maintenance activities would not significantly degrade air quality. It is anticipated that any project-related impacts to air quality would be minor and of short duration.

6.97 The Arkansas Department of Pollution Control and Ecology (ADPCE) does not require air quality permits for mobile sources; therefore, an air quality analysis is not required. Also, the project area is in attainment with air quality standards; therefore, a general conformity analysis is not applicable. The pump station would use totally electric pumps. Diesel generators would be used to provide electricity to the pump station during electrical power outages; however, these generators would not be used to operate the pumps. It is not anticipated that an air quality permit would be required for the generators. Potential air quality issues would be thoroughly coordinated with the ADPCE once the final design for the pumping system is completed.

AESTHETIC VALUE

All Alternatives

6.98 Vegetative clearing associated with construction of the import system would reduce the aesthetic value of the project area. The construction of canal levees and other features would alter the appearance of the landscape; however, establishment of native prairie vegetation within the canal rights-of-ways should offset adverse impacts associated with construction of project features.

DISPLACEMENT OF PEOPLE

All Alternatives

6.99 None of the alternatives would result in the displacement of people. However, all of the alternatives could halt or significantly lessen the displacement of the area's residents expected under future without-project conditions. Under future with-project conditions, the area's income would be greatly enhanced over the levels expected without the project which would prevent the expected loss of area employment.

COMMUNITY COHESION

All Alternatives

6.100 Concern is present within the project area relative to the project sponsor's plans for taxation to finance its share of the project cost. Some landowners question the present need for the project and are opposed additional taxes. Other landowners are concerned over providing the necessary rights-of-way for project construction. These concerns are present for all alternatives. No additional impacts to community cohesion are anticipated.

LOCAL GOVERNMENT FINANCE, TAX REVENUES, AND PROPERTY VALUES

All Alternatives

6.101 All alternatives would halt or significantly reduce the erosion of property values and tax base expected under future without-project conditions thereby maintaining revenues from taxes to the local government entities.

DISPLACEMENT OF BUSINESSES AND FARMS

All Alternatives

6.102 No businesses or farms are expected to be displaced either directly or indirectly as a result of any of the alternatives. The area's agricultural income would be greatly enhanced over the levels expected without the project which would maintain the profitability of the area's businesses and farms. All alternatives would stop any displacement of the area's businesses or farms expected under future without-project conditions.

PUBLIC SERVICES AND FACILITIES

All Alternatives

6.103 All alternatives would prevent the erosion of property values and corresponding decrease in

tax base expected under future without-project conditions. This would maintain the area's ability to provide such basic public services as education, police protection, and roads and bridges.

COMMUNITY AND REGIONAL GROWTH

All Alternatives

6.104 The alternatives would not contribute appreciably to community and regional growth. However, they would prevent the declines expected in the region's economy under future without-project conditions. They would maintain the area's agricultural and agricultural related production, farms and businesses, income, employment, tax base, public services, and urban and rural population necessary to maintain the area's economy at present levels.

EMPLOYMENT

All Alternatives

6.105 All alternatives would prevent the expected declines in agricultural and agricultural related employment along with any decreases in secondary employment expected under future without-project conditions. There would also be some opportunities for new employment associated with project construction, operation, and maintenance.

Cumulative Impacts of Other Projects

POTENTIAL CHANGES IN OPERATION OF EXISTING PROJECTS

White River Navigation

6.106 This project was originally authorized by the Rivers and Harbors Act of 1892. A navigation report was prepared by the Corps in 1969 (under Section 107 of the Rivers and Harbors Act of 1960) and channel improvement was completed in 1971. Annual maintenance within the authorized limits is accomplished by snagging and dredging. The project provides for a navigation channel 4.5 feet deep by 100 feet wide from Augusta (river mile 198), Arkansas, to Newport (river mile 254), Arkansas, at a stage of 3.5 feet on the Newport gage. It provides for a channel eight feet deep by 125 feet wide from the Arkansas Post Canal (river mile 10) to river mile 198 at stages equivalent to or exceeding 12 feet on the Clarendon, Arkansas, gage; a five-foot minimum channel depth is maintained at lower stages. Project maintenance is typically performed once a year from the June-July time frame to October-November time frame. Approximately 1,500,000 cubic yards of material are dredged yearly; dredged material is deposited in the channel.

6.107 No changes in the operation of the existing White River Navigation Project are anticipated.

The project authorizes a level of navigation at a prescribed gage reading. Therefore, any changes in flows or use of the river would not effect the current level of maintenance on the White River. Future increases in navigation traffic are anticipated under the current level of maintenance with or without the Grand Prairie Area Demonstration Project (GPADP).

Reservoir Releases

6.108 A minor adjustment in the reservoir system operation has just been made. This minor adjustment incorporated operations that had been used as a variance to the operational plan for several years. Additional adjustments are not likely in the near future, but any additional adjustment would likely have minor impacts. Greater impacts could occur with a potential study to reallocate storage in the White River Reservoirs. Such a reallocation would require detailed studies and compliance with the National Environmental Policy Act. Some interests have expressed a desire to add environmental purposes to the project and provide greater minimum flows in the upper White River for fisheries. However, no studies are funded at present. The most likely changes would be to reallocate some amount of storage in the reservoirs for low flows. These changes would probably have very small effects at the GPADP pumping station location and below, but any increase in flows would be offsetting to the withdrawal of water for the GPADP and not cumulative.

6.109 The current water control plan for Clearwater Lake, located on the Black River, was developed over 40 years ago. Land and lake usage has intensified and diversified over time, with the current plan not always satisfying the needs and desires of the users in the basin. An alternative water control plan for the lake has been formulated and recommended for permanent implementation by a special ad hoc committee. This alternative plan has been implemented on an interim basis. A draft environmental assessment (EA) has been completed for the permanent implementation of the plan; the draft EA is currently under public review. The effects of the minor changes to the current water control plan would have no significant impacts on White River flows below DeValls Bluff, Arkansas.

Bank Stabilization at Des Arc Public Recreational Facility

6.110 Extensive bank reshaping and stabilization have been completed along the right descending bank of the White River at Des Arc, Arkansas, to protect the local boat launching facility and city park. No wetlands were impacted during construction. This project is located upstream of the GPADP study area; therefore, the GPADP would have no effects on the project or on the ability to launch boats at this site.

PROJECTS UNDER CONSTRUCTION

Montgomery Point Lock and Dam

6.111 The potential hydraulic impacts associated with the Montgomery Point Lock and Dam and the GPADP were examined, and it was determined that the hydraulic effects of the two projects do not overlap.

6.112 A lock and dam can be a partial barrier to fish movements. However, the innovative design of the dam will minimize impacts to fish. Hinged gates will lay flat on the riverbed until the White River experiences low stages during summer and fall. Spawning migrations of big river fishes (e.g., paddlefish, sturgeon, suckers, catfish) during spring will not be effected, but once the gates are raised, upstream and downstream movement of fish between the Mississippi and White rivers may be hindered. Reduced movements of fish can lead to fragmented populations.

AUTHORIZED, UNCONSTRUCTED PROJECTS

6.113 There are two projects that have been authorized for construction and that are now under study. General reevaluation studies are currently underway for the White River Navigation to Newport, Arkansas, and the Bayou Meto Basin, Arkansas, projects.

White River Navigation to Newport, Arkansas

6.114 The White River Navigation Project was originally authorized by the River and Harbors Act of 1892; however, snagging operations were conducted on the river as early as 1870. The Memphis District Corps of Engineers prepared a navigation report in 1969 for the White River under Section 107 of the River and Harbors Act of 1960. This resulted in a channel improvement project from the mouth of the river to Newport, Arkansas. Annual dredging is required in order to maintain a channel bottom width of 125 feet and a depth of eight feet from the Arkansas Post Canal to Augusta, Arkansas, when the river stage is 12 feet on the Clarendon gage. From Augusta to Newport, Arkansas, the project maintains a channel 100 feet wide and 4.5 feet deep at any stage.

6.115 A resolution by the United States Senate, Committee on Public Works, prompted the Memphis District to conduct the White River Navigation to Batesville, Arkansas, feasibility study. A feasibility report and final environmental impact statement (FEIS) were completed in 1979. The feasibility report recommended improving the navigation channel to a depth of nine feet (available 95% of the time) with a bottom width of 200 feet. The selected plan consisted of 56 miles of open river navigation improvements from the Arkansas Post Canal upstream to Newport, Arkansas; 36 stone dikes and stone paving at nine locations for channel stabilization; navigation aids; a scenic overlook and park facilities; a camp site and picnic area; and acquisition of up to 1,865 acres of bottomland hardwood forest to mitigate terrestrial losses. The Water Resources Development Act (WRDA) of 1986 required modifications to the authorized project that would have addressed mitigation for specific environmental impacts. However, these mitigative measures were never

implemented because the WRDA of 1988 deauthorized the project. The project was reauthorized by the WRDA of 1996. Because of the environmental concerns associated with extensive dredging and overbank disposal, the project is being reoriented to rely more heavily on dikes to accomplish the navigation improvements. The dikes have the potential to eliminate overbank deposition of dredged material and to reduce the current level of maintenance dredging. A main report and a supplement to the 1979 FEIS will be prepared as a result of this general reevaluation study.

6.116 Potential impacts of dredging on the White River fishery include removal of instream structure (e.g., woody debris, point sandbars), alteration of coarse substrates (gravel beds), and reduction of water surface elevation. Many fish species that have been documented in the White River prefer instream structure for feeding, reproduction, and avoiding predators and fast currents. Gravel bars occur sporadically in the lower reaches below Newport, Arkansas, but major gravel deposits occur in the upper reach between Newport and Oil Trough, Arkansas. Gravel bars and point sandbars are used as spawning substrates by many species, including those that are uncommon (certain minnows and darters) or declining in abundance throughout their range (paddlefish, sturgeon). Cumulative impact of these alterations may impair growth and recruitment of fishes and lead to population declines. However, the reauthorized project has the potential to reduce annual maintenance dredging. Fisheries concerns will be thoroughly evaluated in the preliminary design and assessment of the project.

6.117 Construction of dike fields may change the river into a narrower and deeper channel. Several studies have shown that emersed dikes create a valuable slack-water habitat for fishes. However, long-term effects of dike fields are varied. In the Missouri River, dike fields resulted in a loss of water surface area; and because of sedimentation, shoreline habitats were lost and many backwaters were eventually isolated from the river. Conversely, a 1986 study of the lower Mississippi River did not observe excessive sedimentation in most dike fields or elimination of slack-water environments. If excessive sedimentation occurs in dike fields proposed for the White River Navigation Project, resulting in isolation of backwaters and losses in shoreline habitat, there may be long-term impacts to the fish community. Lessons learned from both the Missouri River dike fields and Mississippi River dike fields will be examined in order to incorporate measures into the project design to minimize adverse impacts and maximize environmental benefits. The project authorization also includes improvements to offset fisheries losses. Fishery improvement features will be examined in conjunction with resource agencies to determine federal interest.

6.118 Thirty-four species of mussels, including the endangered pink mucket pearly mussel (*Lampsilis abrupta*), are known to inhabit the White River. Dredging of the substrate would physically remove mussels from the river. High-density mussel populations occur on gravel bars; therefore, dredging of gravel bars would have significant adverse impacts to mussels. Mussels could be covered by riprap placed for bank revetment and dike construction if they are not collected and relocated prior to project construction. Also, the scouring action of dikes could adversely affect mussels. Potential impacts to mussels will be assessed during the general reevaluation, and measures to avoid or minimize impacts will be incorporated into the project design.

6.119 Hydraulic studies to determine if water surface elevations would be impacted have not been completed. A principle design goal will be to eliminate or minimize changes in water surface elevations. Although significant reductions in local water surface elevations are not expected, even minor reductions could possibly affect low-lying wetlands. The project should not significantly influence winter and spring overbank flows; therefore, migratory waterfowl should not be adversely impacted.

Bayou Meto Basin, Arkansas

6.120 Section 204 of the Flood Control Act of 1950 authorized a project for the Grand Prairie Region and the Bayou Meto Basin in eastern Arkansas. Due to a lack of local sponsorship, this project was never funded and was subsequently deauthorized by Section 1001(B) of the Water Resources Development Act (WRDA) of 1986. However, removal of rice production limits, a severe drought, and a growing concern for declining groundwater levels renewed interest in developing water conservation and supply projects in eastern Arkansas. The original Grand Prairie Region and Bayou Meto Basin flood control project was reauthorized in the WRDA of 1996 with a broadened scope of work. The scope was expanded to include "...ground water protection and conservation, agricultural water supply, and waterfowl management if the Secretary determines that the change in scope of the project is technically sound, environmentally acceptable, and economic, as applicable." The Energy and Water Development Appropriations Bill, 1998; Senate Report 105-44; House of Representatives Report 105-190; and House of Representatives Report 105-271 (conference report) provided direction and funds to initiate a reevaluation of the Bayou Meto portion of the Grand Prairie Region and Bayou Meto Basin, Arkansas, Project.

6.121 The problems and needs of the project area relative to flood control, groundwater protection and conservation, agricultural water supply, waterfowl management, and environmental enhancement and restoration will be foremost in the development of alternative plans. Previous studies indicate that a combination of measures is required to meet the water supply needs of the area. The identified water supply components are (1) conservation - increased irrigation efficiencies, (2) groundwater, (3) additional on-farm storage reservoirs, and (4) a surface water import system. A water diversion structure on the Arkansas River immediately north of the David D. Terry Lock and Dam at river mile 109 will be used to divert excess surface water into a distribution network of new canals (159 miles), existing streams (363 miles), and pipelines (640 miles).

6.122 Flooding problems occur frequently on many streams within the project area. The greatest flood-control needs are within the Bayou Meto Wildlife Management Area and several areas in the uppermost portion of Bayou Meto. There is an opportunity to develop multi-purpose channels that would provide outlets for reduced flooding and transfer of irrigation flows.

6.123 A major emphasis is being placed on the formulation of environmental project features. Measures to create and/or restore fish and wildlife habitat, increase waterfowl foraging and resting areas, improve water quality, and protect existing surface and groundwater resources will be integral components of all alternative plans. Irrigation and flood-control features will be designed to avoid

or minimize adverse environmental impacts. It is important to note that construction and operation of the Bayou Meto Basin Project would not affect the White River Basin. A major goal of project planning is to formulate a plan with substantial net environmental benefits. An environmental planning team, consisting of representatives from numerous natural resource organizations, has been established to facilitate achievement of this goal.

PROJECT NOT AUTHORIZED BUT FUNDED FOR PREAUTHORIZATION STUDY

Des Arc, Arkansas, Harbor

6.124 No entity has yet been willing to participate as a cost-sharing sponsor in a feasibility study for this potential harbor project on the White River. If a project is ever constructed, the extent of environmental impacts would be dependent on site selection. Potential impacts could include land clearing, deposition in farmed wetlands, excavation of existing oxbow inlets, and/or bank stabilization. Turbidity would increase during the construction phase but should return to pre-construction conditions after excavation is complete.

POTENTIAL PROJECTS NEITHER AUTHORIZED NOR FUNDED FOR STUDY

6.125 The Eastern Arkansas Regional Comprehensive Study was a study authorized in 1982 that encompassed 8,574,461 acres in Eastern Arkansas. The resolution directed the Corps to examine the area in the interest of water conservation and water supply of both surface and subsurface water for municipal, industrial, and agricultural purposes. The study identified five areas that were feasible for development of alternate sources of irrigation to protect the aquifers and the economy. Studies were terminated before the report was approved because agricultural water supply is not a Corps priority. These areas included the Grand Prairie Region and Bayou Meto Basin Project area that were reauthorized for construction in the WRDA of 1996. The remaining areas include the Black River area, the White River area, and the Little Red River area. These areas are not authorized for construction or funded for preauthorization studies. Available information includes the preliminary draft feasibility report and preliminary draft environmental assessment that were not approved by the Corps. A preliminary draft planning aid report was also received from the U.S. Fish and Wildlife Service. Although these reports are only preliminary drafts, they offer the best available information on these potential projects. These studies did not progress to the point of examination of the availability of water and minimum stream flows. All plans were similar in that they incorporated increased efficiencies and on-farm storage and had environmental components (e.g., waterfowl flooding, additional fish habitat).

6.126 The Black River area would provide irrigation water to 805,000 acres of cropland through a 1400 cubic feet per second (cfs) pumping station located on the Black River. Water would be delivered through 316 miles of new canals and 723 miles of existing channel. The plan included 452,026 acre-feet of storage and 315 weirs to provide 85,000 impounded surface acres.

6.127 The White River area would consist of a 140 cfs pumping station on the White River to

supply irrigation water to 47,959 acres through 39 miles of new canals and 15 miles of existing channels. The plan included 23 weirs and 8,021 acre-feet of storage reservoirs for a total of 1,912 surface acres of impounded water.

6.128 The Little Red River area would consist of four small pumping stations, three located on the Little Red River (404 cfs, 156 cfs, and 92 cfs) and one located on the White River (28 cfs) for a total capacity of 680 cfs. The delivery system would consist of 92 miles of new canals and 117 miles of existing channel. The plan included 85 weirs and 23,318 acre-feet of storage to create 5,452 acres of impounded surface water.

6.129 Based on the findings of GPADP general reevaluation, it is likely that the impacts of these other potential irrigation projects on the White River fishery would be negligible, provided the 1986 state water management plan stop-pump criteria remain in effect. There would be slight reductions in surface water elevations that could temporarily isolate oxbow lakes and other backwater areas. Conversely, these projects would provide benefits to tributary streams within the basin by providing a year-round source of water and by insuring minimal pool elevations are maintained within these streams. Impacts to wetlands and other wildlife habitat associated with construction of project features (e.g., canals, pipelines, weirs) would be similar to those identified and evaluated for the GPADP. Any adverse hydraulic impacts to wetlands would probably be restricted to the lower topographic zones. In-depth impact assessments would be conducted as part of any pre-authorization study that may be funded in the future.

6.130 If detailed studies were undertaken on any of these areas, they would have to be planned assuming all federally authorized projects are constructed, including the Grand Prairie Area Demonstration Project (GPADP). Water availability would have to be analyzed to insure that the federal investments in the GPADP and the White River Navigation Project were protected. If an examination of water availability were made and all projects (as presented in preliminary draft report) were found to be feasible and environmentally sound, the total pumping capacity of these projects (including the GPADP) would be 3,860 cfs. Assuming these projects were in place, the Grand Prairie would have the same stop-pump cutoff flows. The maximum cumulative effects would be above the cutoff levels when all projects could withdraw water.

ACTIONS BY OTHERS

Increase Irrigation Pressure on Natural Streams

6.131 With or without the project, the practice of using natural streams for irrigation is likely to increase, further degrading natural streams outside of the project area. The installation of tailwater recovery systems and use of water from natural streams could decrease the amount of water available in the White River during high irrigation months and times of abnormally low rainfall. However, the decrease would likely be immeasurable. In any case, the stop-pump criteria for the GPADP would not change; and therefore, once the stop-pump elevation is reached, the effects of the project would cease. The only possible effects could be to the connectivity of oxbow lakes in the vicinity

of the project. The conditions at these lakes will be monitored.

Highway 70 Bridge over White River at DeValls Bluff, Arkansas

6.132 The realignment and construction of the new bridge are in progress. The construction of the bridge involves minimal land clearing for the right-of-way. Project construction has resulted in increased turbidity within a limited section of the White River; however, water quality will return to pre-construction conditions following project completion. Best management practices (e.g., silt screens, placement of hay bales) are being employed during construction to minimize impacts to water quality.

Highway 64 Bridge over White River at Augusta, Arkansas

6.133 This project is currently under construction. The alignment of this White River crossing is slightly upstream of the existing bridge. Adverse effects include impacts to borrow ditch wetlands. Turbidity resulting from the construction phase will be temporary. Water quality will return to pre-construction conditions following project completion.

Highway 79 Bridge over White River at Clarendon, Arkansas

6.134 The preferred alternative has not been selected at this time. However, due to the proximity of the White River and Cache River national wildlife refuges and the potential degradation of wetlands at this location, impacts could be significant. Also, mussel beds are located within the Clarendon vicinity. The endangered pink mucket pearly mussel has a high probability of existing in these beds.

Interstate 69

6.135 Consideration is being given to routing Interstate 69 through Arkansas; however, an alternative has not been selected. A corridor study is currently underway to identify and evaluate potential alternative routes. It is unknown whether the selected alternative will cross the White River.

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8. PUBLIC INVOLVEMENT

8.1 This chapter describes the public involvement program to date and discusses how public views guided and were incorporated into the study process. It also describes future public involvement and includes the list of agencies, groups, and individuals to whom the General Reevaluation Report/final EIS will be sent.

Public Involvement Program

8.2 The public has been involved in this study throughout its history. A public scoping meeting was held in Stuttgart, Arkansas, on 8 December 1992, to provide information on the general reevaluation and the proposed project, discuss project related issues and concerns, and solicit public comments. Over 200 people attended this meeting; representatives from state and Federal agencies and private organizations as well as interested individuals were present. In addition, three series of "shop" meetings were held during 30 August - 3 September 1993 (seven meetings), 24-25 January 1995 (eight meetings), and 5-6 June 1996 (eight meetings) at various locations throughout the project area to discuss all aspects of the study; attendance at these meetings ranged from 15 to over 50. Many of these meetings were actually held in equipment maintenance shops on project area farms. The dates, times, and locations of these shop meetings were announced by radio and newspaper; and written invitations were mailed to all landowners and farmers within the project area. Furthermore, numerous coordination meetings were held among the Memphis District, White River Regional Irrigation Water Distribution District (WRIWDD), NRCS, and various agencies and organizations. Many informal meetings and field investigations were also conducted throughout the course of this study in order to coordinate project activities with interested parties.

8.3 A number of project briefings were given to various groups and organizations throughout the project area. During February and March 1995, a series of public presentations, covering many facets of the study (i.e., planning, engineering, economics, environmental), were given at the University of Memphis. Presentations concerning various environmental aspects of the project were given at several regional and national conferences/symposia and large meetings including the 22nd Annual Natural Areas Conference, 25-28 October 1995, Fayetteville, Arkansas; The Mississippi River and Her People Symposium, 14-16 March 1996, Memphis, Tennessee; The Delta Conference, 13-16 August 1996, Memphis; and a White River Coordinating Committee meeting, 29 February 1996, Little Rock, Arkansas. Numerous environmental presentations were also given at various locations within the project area.

8.4 Project exhibits were displayed at (1) Arkansas, Prairie, Lonoke, and Monroe county fairs during the autumns of 1994 and 1995 and (2) the Wings Over the Prairie Festival in Stuttgart, Arkansas, during 24-25 November 1995 and 29-30 November 1996. The Wings Over the Prairie Festival and accompanying World Championship Duck Calling Contest annually draw large

numbers of people from all over the nation to Stuttgart and vicinity. Project information pamphlets were handed out to the public and informational videos were shown at all the exhibits. Memphis District and WRIWDD representatives tended the booths, addressing questions and concerns of the public.

8.5 On 15 September 1998, during the public review period for the draft EIS, a public workshop was held in Stuttgart, Arkansas. This workshop was held to provide information on the general reevaluation, address questions and concerns, and receive input and comments on the draft EIS.

8.6 This intensive public involvement program was initiated, in part, to solicit input from individuals and interested parties so that problems, needs, and opportunities within the project area could be properly identified and addressed. It also provided project status updates to concerned organizations and the general public. Public concerns during this study often pertained to potential project impacts to (1) navigation; (2) aquatic resources and wetlands; and (3) area residences, farm buildings, and other improvements. Project area farmers were also concerned about the projected cost of project-supplied irrigation water.

Coordination

8.7 Numerous environmental planning meetings were held throughout the study. Broad in scope, many of these meetings were held to identify and address environmental issues and concerns relative to the overall project. The objectives of these meetings were to minimize environmental conflicts, miscommunication, and project delays; maximize environmental expertise available for consultation; facilitate development of environmentally sensitive plan alternatives; identify potential environmental project features; and identify possible survey and impact assessment procedures. In addition, environmental meetings were held to address specific environmental issues. For example, meetings were held to develop environmental project features; plans to flood harvested rice fields for migratory waterfowl and shore birds and to restore native prairie grasses in project rights-of-way were developed as a result of these meetings as well as additional coordination and planning. Meetings were also held to identify and select appropriate measures for assessing baseline conditions of and impacts to aquatic resources and wetlands. Among the attendees of various environmental meetings were representatives from the Memphis District, White River Regional Irrigation Water Distribution District, Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), National Biological Service, U.S. Army Waterways Experiment Station, Bureau of Reclamation, Arkansas Game and Fish Commission (AGFC), Arkansas Natural Heritage Commission (ANHC), Arkansas Soil and Water Conservation Commission, University of Arkansas, Arkansas State University, University of Memphis, and Ducks Unlimited. Furthermore, extensive communication was established and maintained with key natural resources agencies such as the USFWS, NRCS, AGFC, and ANHC.

8.8 The final environmental impact statement has been provided to the following agencies, groups, and individuals for their review and comment. Additional state and agency mailings have also been accomplished in accordance with Corps policy for processing final environmental impact statements.

**FINAL REPORT/EIS
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Mr. James Bruce McMath
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PUBLIC LIBRARIES

Central Arkansas Library System
Main Library
100 Rock Street
Little Rock, AR 72201

Carlisle Public Library
Fifth Street
Carlisle, AR 72024

Stuttgart Public Library
2002 South Buerkle
Stuttgart, AR 72160

Arkansas State Library
#1 Capitol Mall
Little Rock, AR 72201

DeWitt Public Library
205 West Maxwell
DeWitt, AR 72042

Hazen Public Library
Hwy. 70 East
Hazen, AR 72064

INDIVIDUALS AND LOCAL INTERESTS

The Honorable Harry Richenback
Mayor of Stuttgart
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Stuttgart, AR 72610

Mr. Don Bevis
Lonoke County Judge
Lonoke, AR 72086

Mr. Tom Catlett
Monroe County Judge
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Recommendations of U.S. Fish and Wildlife Service

8.9 This section contains a list of the major mitigation and conservation measures recommended by the U.S. Fish and Wildlife Service (USFWS) and the Memphis District responses to those recommendations. These USFWS recommendations as well as the entire Fish and Wildlife Coordination Act report are contained in Volume 9, Appendix C, Section VI.

RECOMMENDED MITIGATION MEASURES

8.10 Comment 1 - Conduct a proportional analysis study, instream flow incremental methodology, or similar instream flow study to determine minimum instream flows to protect the fisheries of the project area streams and oxbow lakes, and manage water withdrawal in compliance with minimum flow needs.

Response - The fishery study conducted by the U.S. Army Waterways Experiment Station (Volume 9, Appendix C, Section V) adequately addresses potential project impacts and benefits to area fisheries. Project-induced changes in surface water elevations on the White River are not sufficient to impact minimum flow requirements of fish; therefore, further studies are not warranted.

8.11 Comment 2 - Operate the project to comply with the water allocation levels proposed by the Arkansas Soil and Water Conservation Commission.

Response - The project alternatives were formulated based on allocation limits and minimum flow requirements set by state law for the White River. Plan formulation based on “proposed” allocation levels would not have been prudent; furthermore, current requirements are more restrictive than allocation levels presently being proposed. The sponsor would be bound by the project cooperation agreement to the stop-pump criteria in the draft 1986 State Water Plan.

8.12 Comment 3 - Institute a larval fish monitoring program to more accurately measure entrainment of larval fishes.

Response - Concur. A post-construction monitoring program will be designed, with input from natural resource agencies, and implemented in order to more accurately estimate entrainment of larval fishes.

8.13 Comment 4 - Explore alternative sources of water supply that are not infested with zebra mussels.

Response - The White River is a nearby source of water that has a flow volume and level of water quality sufficient for irrigation use in the Grand Prairie. Direct construction impacts to environmental resources would be greater if water had to be conveyed from a source farther from the project area. Fisheries within tributary streams are limited and mussels are scarce due to

excessive water withdrawals for irrigation purposes. The additional water supplied by the project and the pooling effect of the weirs would benefit fish within the tributaries (see Volume 9, Appendix C, Section V) and should also benefit native mussels. Moreover, if zebra mussels become prolific in the White River, their introduction into the smaller project area streams is likely inevitable even without the project.

8.14 Comment 5 - Acquire in fee title and intensively reforest 245 acres of farmed wetlands and 200 acres of prior converted croplands. Management of mitigation lands should be at project expense over the 50 year life of the project.

Response - The Memphis District employed the Habitat Evaluation System (HES) to analyze project impacts to wildlife habitat and to determine compensatory mitigation requirements. The HES analysis revealed that 243 acres of cleared land would have to be acquired and planted in selected bottomland hardwood species to offset habitat losses associated with impacts to bottomland hardwoods and other wetlands; it was also determined that 193 acres of cleared land would have to be obtained and planted in selected upland hardwood species in order to mitigate impacts to upland hardwood forests. There is only a small discrepancy (nine acres) between the mitigation estimates of the U.S. Fish and Wildlife Service and the Memphis District, and this minor discrepancy can be resolved. However, typical upland sites should be targeted for upland hardwood reforestation, not prior-converted farmland. The local sponsor is required to obtain all project lands (including mitigation lands), easements, and rights-of-way. Operation and maintenance of the mitigation lands is also a responsibility of the local sponsor. Compensatory mitigation, a total of 436 acres, was determined assuming no management other than insurance of 66% seedling survival one year from planting.

8.15 Comment 6 - Conduct contaminant surveys before and after project completion to insure that contaminant levels do not become elevated in the irrigation water.

Response - A water quality assessment (see Volume 9, Appendix C, Section III) was performed during this study. A water quality monitoring program would be implemented prior to and following project implementation.

8.16 Comment 7 - Locate irrigation canals and on-farm reservoirs away from wetlands and natural heritage sites.

Response - Alignments of proposed canals and pipelines have been placed to minimize, to the extent practical, impacts to forests, wetlands, and prairie remnants; these alignments have been coordinated with key resource agencies. The project was planned and evaluated with the assumptions that the new on-farm features (i.e., reservoirs, tailwater recovery systems) would be constructed on non-wetland agricultural lands and that any variance would require a farmer to apply for and obtain a Section 404(b)(1) permit. The NRCS currently estimates that approximately 200 acres of farmed wetlands would be lost to construction of on-farm features. Approximately 200 acres of farmed wetlands or prior converted farmland would be acquired and planted in bottomland hardwoods to

mitigate these impacts. It is important to note that these are only estimates of the on-farm impacts and subsequent mitigation. The actual impacts and compensatory mitigation would be determined as each on-farm plan is completed. Mitigation would be acquired at the same rate as construction of the on-farm features.

8.17 Comment 8 - Develop objective, quantitative criteria for the long term goals of prairie restoration, rather than evaluate the project based on initial effort, and monitor restoration efforts.

Response - Experimental studies will be conducted in order to develop a plan to restore native prairie vegetation within the proposed canal rights-of-way. Restoration efforts will be monitored.

RECOMMENDED CONSERVATION MEASURES

8.18 Comment 1 - Design on-farm reservoirs to benefit shorebirds.

Response - Concur. The Natural Resources Conservation Service (NRCS), in conjunction with the Arkansas Game and Fish Commission, has developed a general design for a sloped reservoir that would provide additional benefits to shorebirds, waterfowl, and fish. The NRCS would promote this sloped-sided reservoir design to area farmers.

8.19 Comment 2 - Install BMPs (best management practices) on agricultural land to reduce channel maintenance and improve water quality.

Response - Concur. On-going programs by the NRCS and conservation features included as a component of this project are designed to accomplish these goals.

8.20 Comment 3 - To increase fish and wildlife habitat and use of the resources, install weirs and grade control structures in the new canals, properly design canals, and provide public access.

Response - These items are an integral part of the project. The sponsor would provide access to project lands where they have sufficient interests and where public safety is not a concern.

8.21 Comment 4 - Install overfall pipe structures at the mouth of small streams and farm ditches to improve water quality and reduce channel maintenance.

Response - Concur. Design of the on-farm system (i.e., tailwater recovery) incorporates overfall pipe structures.

8.22 Comment 5 - Revegetate the channel ROW (rights-of-way) to increase wildlife habitat and opportunities for recreational pursuits.

Response - An attempt would be made to restore native prairie vegetation within the canal rights-of-way. If successful, this would benefit grassland wildlife species. The sponsor would provide

provide recreational access to project lands where they have sufficient interests and where public safety is not a concern

8.23 Comment 6 - Restore prairie habitat by acquiring remnant prairie and increase the acreage of prairie habitat by revegetating adjacent land with prairie species.

Response - In conjunction with the Arkansas Natural Heritage Commission and the Plant Materials Center, NRCS, the Memphis District is developing a plan to restore native prairie vegetation within the rights-of-way of proposed irrigation canals. Prairie remnant acquisition would be limited to the amount necessary to mitigate project-induced impacts to prairie.

8.24 Comment 7 - Address cumulative impacts of all five irrigation projects proposed in the Eastern Arkansas Project.

Response - Cumulative impacts of all five irrigation projects have been addressed in this final EIS.

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11. ACRONYMS

A/E	architect/engineer
AFGC	Arkansas Game and Fish Commission
ANHC	Arkansas Natural Heritage Commission
ASPRS	American Society for Photogrammetry and Remote Sensing
BMPs	best management practices
CFS	cubic feet per second
COE	Corps of Engineers
DDT	dichloro-diphenyl-trichloro-ethane
DEIS	draft environmental impact statement
DUDs	duck-use-days
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FEIS	final environmental impact statement
GIS	geographic information system
GPADP	Grand Prairie Area Demonstration Project
GRR	general reevaluation report
HES	Habitat Evaluation System
HQIs	habitat quality indices
HTRW	hazardous, toxic, and radioactive waste
HUs	habitat units
HUV	habitat unit value
MAV	Mississippi Alluvial Valley
NED	national economic development
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWR	national wildlife refuge
ROW	right(s)-of-way
RREC	Rice Research and Extension Center
SNARC	Stuttgart National Aquaculture Research Center
STORET	Storage and Retrieval of Environmental Data
USFWS	U.S. Fish and Wildlife Service
WES	U.S. Army Waterways Experiment Station
WMA	wildlife management area
W/O	without
WRRIWDD	White River Regional Irrigation Water Distribution District